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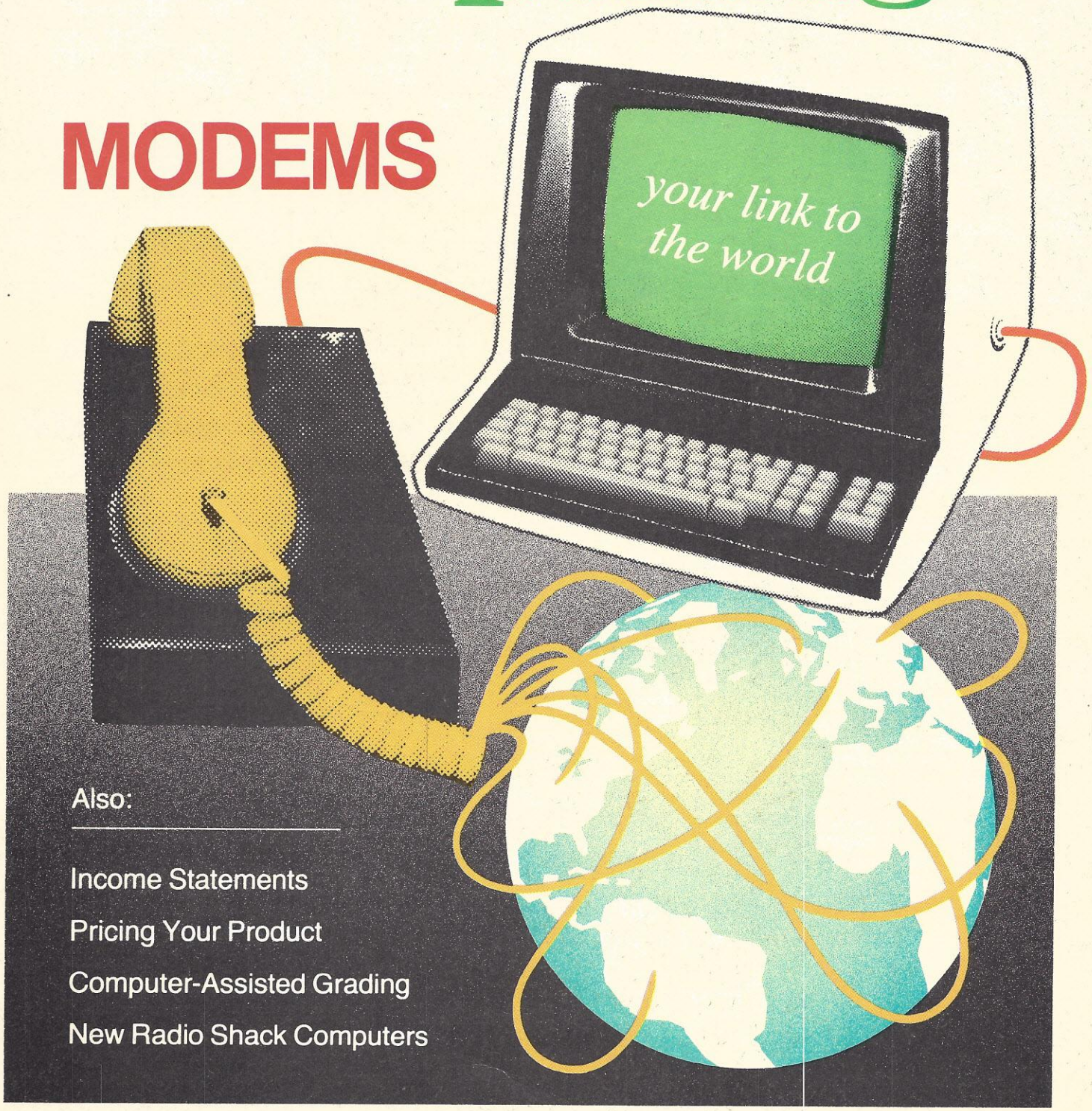

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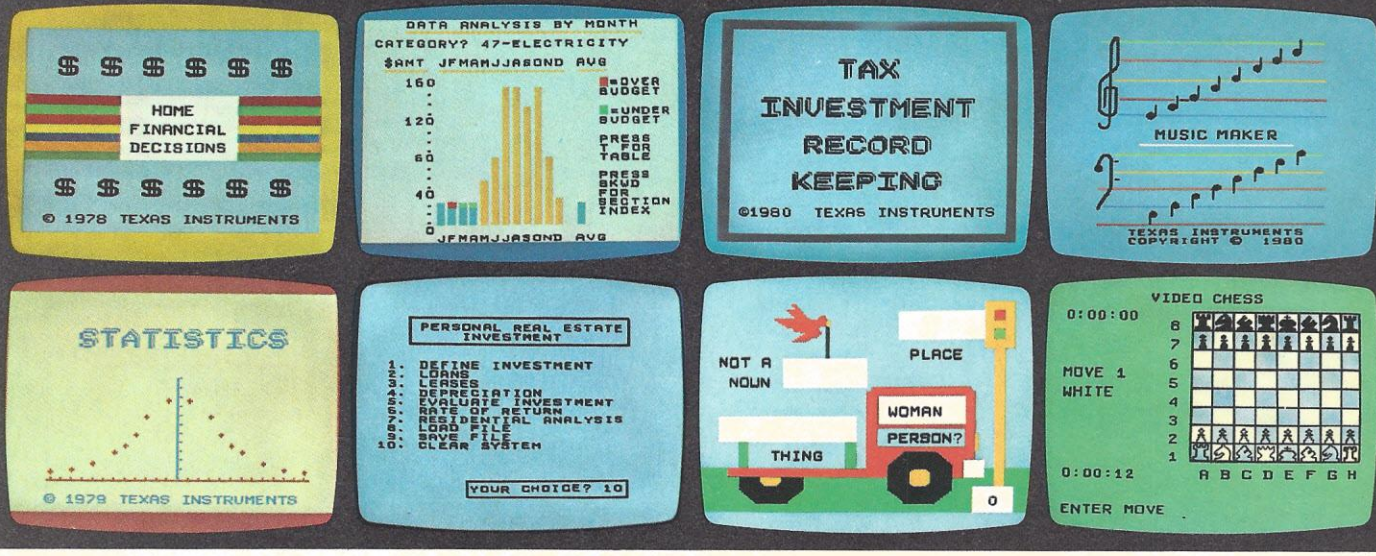

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CIRCLE 2

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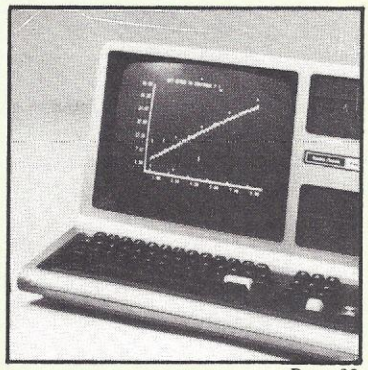
PC10

CIRCLE 3

OCTOBER 1980 VOL. IV, NO. 10

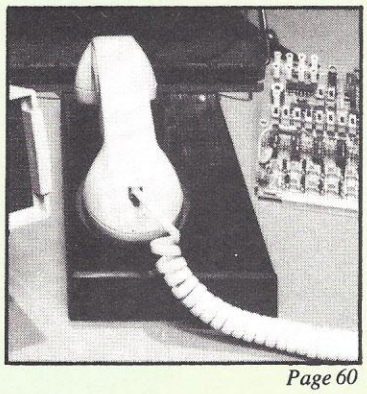
Personal Computing

For Your Home and Business



Page 32

Page 56



Page 60

Cover design by Donni Richman

DEPARTMENTS

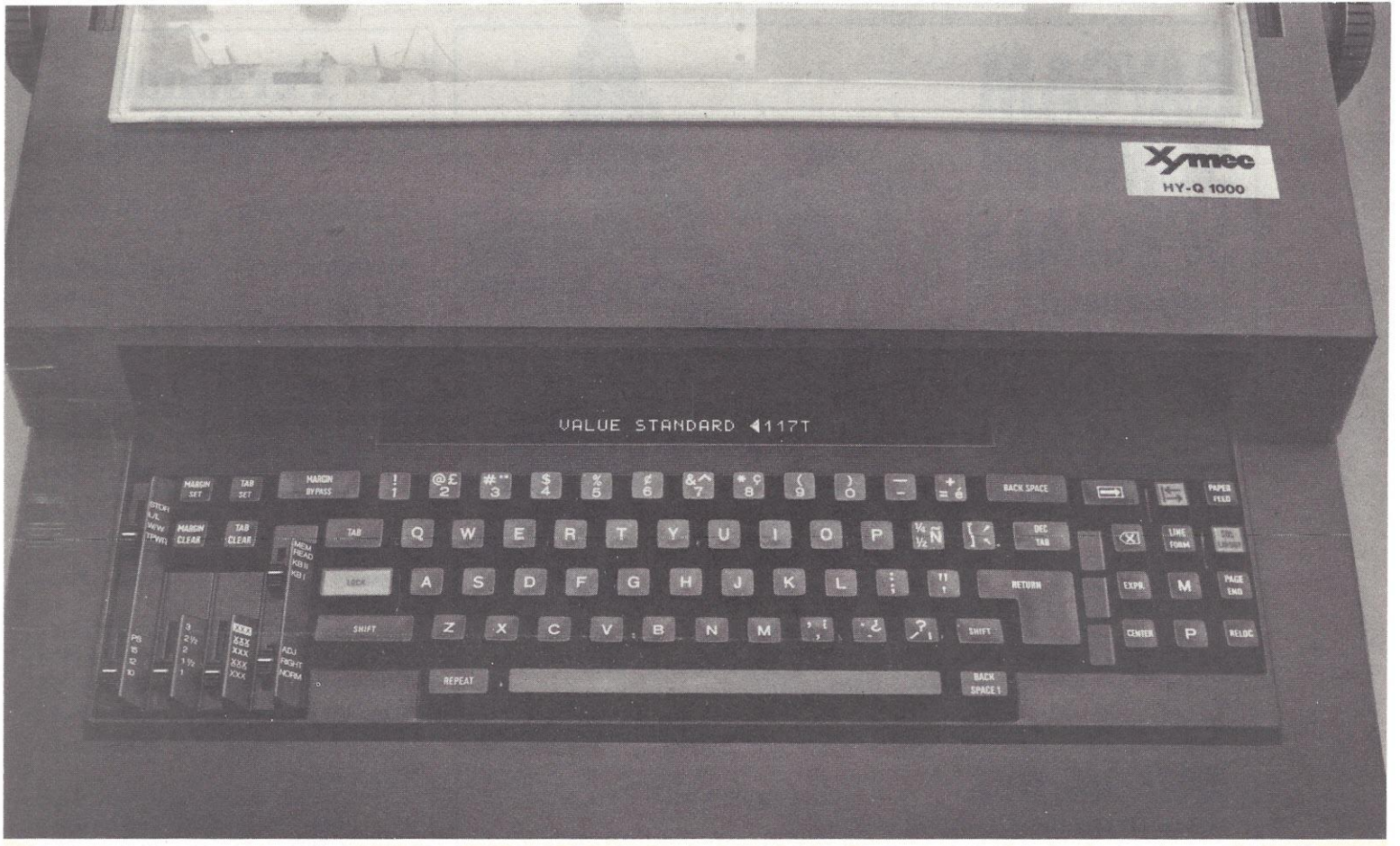
LAUNCHING PAD

DIGGING IN

ON THE LIGHTER SIDE

IN THE MONEY

Publication Number ISSN 0192-5490



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CIRCLE 4

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Personal Computing

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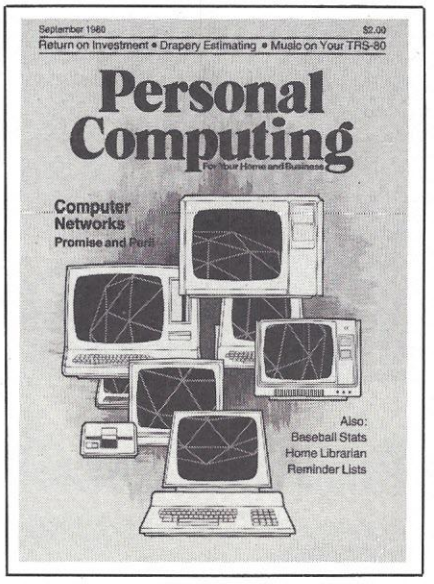
CIRCLE 6

Missing Key

Dear Editor:

In spite of the convenience of the TRS-80 numeric keypad for inputting large amounts of numeric data, it has one flaw that has thoroughly annoyed me, and perhaps other users, many times. This flaw is the absence of a "," (comma) key on the keypad. Such a key seems to me to be essential for using multiple variable INPUT statements, and without it, one either has to (1) stop typing on the keypad, reach over all the way to the main keyboard, press the "," key, then return to the keypad and type the next number; (2) use the right hand to enter the numbers on the keypad while keeping the entire left hand hovering over the comma, waiting for the proper moment to strike; (3) hit ENTER after each number is typed, allowing any information at the top of the screen to scroll off; or (4) give up the keypad entirely and use the numeric row at the top of the main keyboard. All four of these approaches are either time-consuming, loaded with the potential for error, or both.



However, filled with the determination of any good computer jockey not to be overcome by the limitations of the equipment, and my own natural inclination to make things as easy for myself as possible, I wrote the following short program. It can be added to any program as a subroutine, and simulates the function of a comma key on the numeric keypad. (See Figure 1.)

As you can see, the separating comma is simulated by entering the decimal point twice. (Incidentally, this in no way interfers with the normal function of the decimal point.) Lines 10 to 90 are the main program to which the subroutine is added. Line 30 would have originally read, 30 INPUT A,B,C. Change it now to INPUT A$ and GOSUB, and add line 35 to assign the numeric values of the "X" strings to the variables used by the main program. The subroutine can be changed if more or less than three variables are to be input at once; just change the counter in the Z-loop in 1010, and the IF/THEN statement in 1080 to the appropriate number, and correct the variable assignments in 35. Before adding this subroutine to any program, check to find the proper variable names you want to input, and check for and change any of the variables in the subroutine which would interfere with those already used in the program. With this method, one can now have fast entry of numbers from the numeric keypad. The computer takes about 1/2 second to process the numbers, but input time is so speedy I am spending at least 50% less time than I formerly did with this operation. As far as I am concerned, the only drawback that the routine has is that it can't be used to enter long DATA lines when programming!

While I am writing, I want to compliment and thank the staff of *Personal Computing* for continuously putting out such an enjoyable and exciting magazine. I subscribe to several computer-oriented magazines, but *PC* is my favorite, and the amount of information and pleasure I have received from it are immeasurable.

Robert P. Aden
Murfreesboro, TN

Program Listing

```
10 '***** "ORIGINAL PROGRAM" *****
20 ? "INPUT THREE NUMBERS"
30 INPUT A$ : GOSUB 1000    '***** (INPUT A,B,C)
35 A=VAL(X$(1)) : B=VAL(X$(2)) : C=VAL(X$(3))
40 ? A; "+"; B; "+"; C; "="; A+B+C
50 ? "("; A; "*"; B; ") /"; C; "="; (A*B)/C
60 ? A; "-"; B; "↑ ABS("; C; ") ="; A-B↑ABS(C)
70 ? : GOTO 20
80 '***** END ORIGINAL PROGRAM *****
90 END
1000 '***** COMMA SIMULATOR SUBROUTINE *****
1010 FOR Z=1 TO 3
1020 X$(Z)=""
1030 L=LEN(A$)
1040 Q=0 : FOR Q=1 TO L
1050 F$=MID$(A$,Q,2)
1060 IF F$=".." THEN 1100
1070 X$(Z)=X$(Z)+LEFT$(F$,1)
1080 NEXT Q : IF Z=3 THEN RETURN
1100 L=L-(LEN(X$(Z))+2)
1110 A$=RIGHT$(A$,L)
1120 NEXT Z
```

Sample Run

```
INPUT THREE NUMBERS
? 37..2.93..-15.8
37 + 2.93 + -15.8 = 24.13
( 37 * 2.93 ) / -15.8 = -6.86139
37 - 2.93 ↑ ABS(-15.8 ) = -2.37963E+07
```

Figure 1

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(TRS-80 is a trademark of the Radio Shack division of Tandy Corp.)

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173-100

Software for Lower Case Mods

Dear Editor:

I'd like to address David Rose's article "Moving Up to Lower Case," July 1980.

On page 58 under the heading "Use with other software," he brings out the point that Radio Shack's mod eliminates the use of a large amount of existing software. Well, I have purchased two products that I believe your readers would like to be aware of. They are described below, and have been in existance since late last year.

In PencilC, the modifications described were done with permission of Michael Shrayer Software Co. and are available only by returning the original media cassette to Lords.

PencilC will operate on both the Shack lower case mod and the original type modification done by progressive individuals much earlier. Radio Shack's lower case mod works great with PencilC so now people who prefer Radio Shack's descending characters don't need to be limited in their software use.

The Shift Down Arrow has been converted to the control key, and the button will still operate as shown in the Electric Pencil manual. The Form Feed is now a "Control L." Although the options are executed in the sub-command mode (K), none of them appear in the command list on the screen.

The authors of the modification didn't stop until they had all the meat in the pot. So to quiet the hungry savages they added "Free," which tells the typist how much memory is left unused.

For "Speed Freaks," they included a high speed clock control. This is an automatic software routine for systems that have a hardware clock speed-up board installed. It not only allows faster input of text and handling routines, but eliminates the loss of character which sometimes happens at the end of a video line. For systems with the proper hardware modification, the software automatically "kicks" the clock into high speed and resets the clock slower for disk I/O, line printer output, and TRS232 output operations. Those machines that trouble with high speed clock and upper memory stability can use "option K" in the sub-command file to shut off the high speed clock.

The Special Character Definition option allows the operator to define the Shift Back Arrow, normally used to erase the previous character, as any printable character on the printer. This is especially useful to systems with "daisy wheel" printers to allow access to all but the first and last characters.

Once a special symbol is entered to text, the Shift Back Arrow may be redefined for another character. Once this

option is used however, the original Shift Back Arrow cannot be used to erase until you reboot the PencilC program.

"Page Halt" commands the Pencil printer output to stop at the end of each page as set by the sub-command (K) G function or the Top of Page Indicator in the text. The purpose of the option is to allow insertion of a new sheet of paper or to change print elements, change margins, line length, reset print specifiers, and so forth. Pressing "ENTER" will continue the printing, or by pressing the "BREAK" key the print cycle can be terminated and the page numbering option will be automatically reset to the original value.

Quime or Diablo users will want to know about the special RS232 driver. Sub-command "UB" allows use of these high speed printers at their rated speed without having to use Null characters for carriage returns. The RS-232 switches are used characters for carriage returns. The RS-232 switches are used to set the baud rate, parity and word length.

Trendata 1000 users have a special correspondence printer driver available for cassette use. The baud rate is automatically set to 134.5 and all characters are automatically set for the Courier 10 print element. Also the Special Character Definition option will allow back spacing and limited underlining.

The cost is $35 and the Electric Pencil "C" can be used with the following DOS: TRSDOS 2.1, 2.2, 2.3 and NEWDOS. Customers should send us their original cassette of Pencil (disk version stamped on the case). We've heard all kinds of excuses for not sending the original cassette, so if you've recently had a fire send $175 and we will send out a new cassette, with PencilC disk version on it. Be sure to mention your memory size.

Lords also offers a lower case software mod for use with Radio Shack's hardware mod. It allows use of software normally mentioned on Shack's "Forbidden List," and is loaded utilizing the "AUTO" command on the DOS. We charge $20 for it.

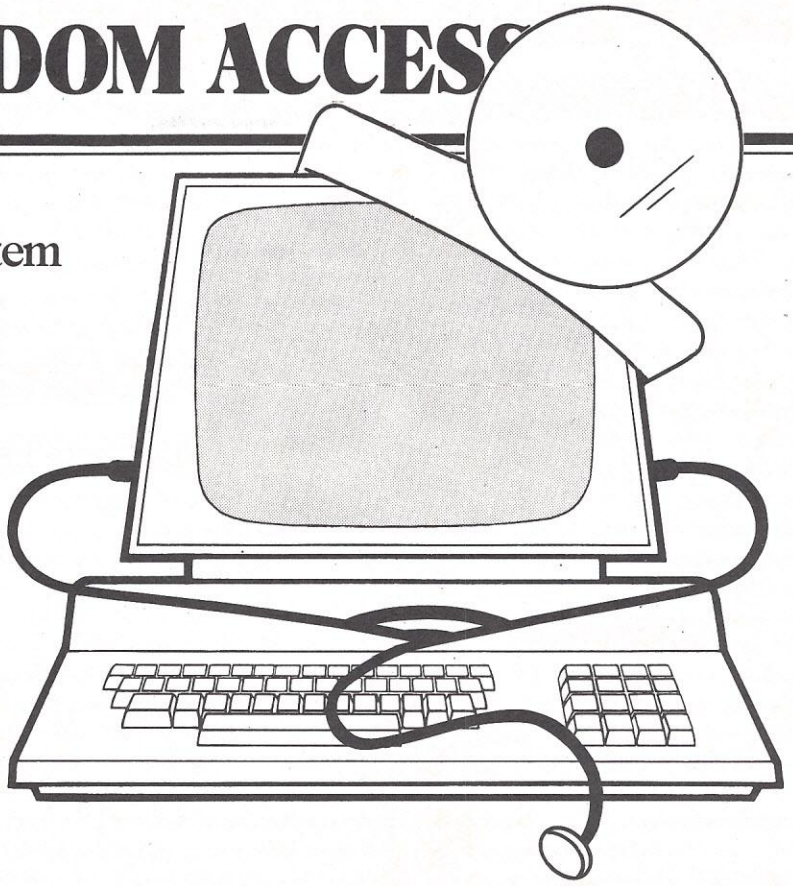
Allen Barker
Lords
P.O. Box 99
Port Angeles, WA 98362

Letters . . .

Have you found a bug? Got a gripe? Want to tell our readers about your successes, failures or fascinations? Send your comments to the Feedback editor, *Personal Computing*, 1050 Commonwealth Ave., Boston, MA 02215. We'll review each letter and publish the most interesting and valuable submissions.

RANDOM ACCESS

Pediatric Information System



Your four-year-old son scurries in from playing outdoors, complaining of itching around his ankles. After questioning him on where he's been and examining the rash, you realize it must be poison ivy. What should you apply to it, if anything? How long before it disappears? You turn to your microcomputer for help.

Mathemedics, Ltd., a new, small company in southern California, is working toward making it possible for parents to get medical information from their micros. Matthew Witten, president of Mathemedics, said, "We wanted to design medical information systems — not only information systems but medical mathematical research and modeling." And, says Witten, a parent himself, "I got tired of calling my pediatrician."

The system, known as the Syntactical Pediatric Evaluation Diagnostic System, is compiled from information from published medical material. Witten has had three years of med school but says the system will be checked for accuracy before it's released to the public.

Witten explained that the system operates in several modes. You'd use the critical mode if you already knew what the problem was but needed emergency information. You would type in the problem and the computer would come back with a standard set of information. With this mode, there's no time to diagnose what the problem is.

Another mode, for non-emergency situations, handles treatment information. For instance, your child might have something in his/her eye and you can't remove it; or a child could be running a fever of 105° and you don't know what steps to take.

A third interactive mode provides clinical information. You can type in a question and get answers in various areas. Poison ivy might come under this mode. "Let's say your child had a rash that you were'nt worried about but you wanted to find out about it. You'd tell the computer you needed information on general rashes and it would tell you a little about skin rashes. Then, if you wanted information about poison ivy, the computer would offer more specific information about it," explained Witten.

The diagnose mode specifically deals with trying to diagnose what the problem is. It uses statistical correlations to come up with what the top ten most probable diagnoses for the problem are. This, the most difficult and complex mode, is not yet on the small computers because it requires one megabyte of memory storage for the database. "What we're thinking of doing is shrinking the mode down and taking out the crucial things and making a smaller version," said Witten.

Mathemedics, run by Witten and his partner David Maloney, is divided into a research division and an applied systems division. The research division contains larger computers whereas the applied systems division uses the microcomputers.

Witten said, "We wanted a company that was not only computer oriented in the sense that we designed computer equipment software, but a company that someone could hire out to do statistical analysis of data."

Other Mathemedics projects include software for paraplegics which will enable them to read by blowing commands through pipes. The company also consults for a few hospitals, helping them with data analysis.

Besides working for Mathemedics, Witten is also a professor in the general systems department of the Institute for Safety and Systems and Management at the University of Southern California. He teaches business management courses in mathematical modeling and computer simulation.

— by Marjorie J. Morse

Personal Computing Welcomes S-80 Computing

Personal Computing this month welcomes aboard over 7000 subscribers to *S-80 Computing*.

Computer Information Exchange's *S-80 Computing* and *S-80 Bulletin* publications have ceased publishing. *Personal Computing* will fulfill subscriptions to *S-80 Computing* on either a new or renewal basis.

No longer able to justify operating redundant services in competition with a host of others, nonprofit CIE will concentrate on People's Software and its long-dormant *Word Processing Letter*, areas not served by others.

CIE's People's Software provides public-domain TRS-80 programs for the cost of copying. Tapes with as many as 77 programs are available for just $10.95. The organization now offers approximately 200 programs on its five public domain tapes. In addition, People's Software offers a tiny Pascal compiler for $19.95, with royalties to Pipedream Software in Australia, and other offerings.

Word Processing Letter is devoted to using personal computers for writing, either in the home or office. The first issue tells about a readily available 510 characters/second daisywheel-quality printer that is about ten times faster than the fastest "daisies," yet only about twice as expensive. Also included is a wrap-up on the new copying machines that not only do what you expect of a copying machine, but which also output type and graphics from your computer and facsimile machine. Sometime in the not too distant future, all office printing will come out of the same box, said Bill McLaughlin, president of CIE.

Word Processing Letter also has started a reader project of creating personal computer software to match features of the new IBM electronic-dictionary word processor. IBM stores 50,000 words but the *Word Processing Letter* project will be more modest. Readers will share both the burden of creating the software and keyboarding all the words, which will be distributed on cassette. The *Word Processing Letter* costs $15 for 12 issues, and is also available from CIE.

For a People's Software catalog or more information on the *Word Processing Letter*, write to Computer Information Exchange, Box 159, San Luis Rey, CA 92068.

Remedial Instruction by Computer

Using a Pet computer, elementary students in Edina, MN, progressed up to 31 months over a seven month period in their language arts skills. While program developers do not claim that this progress is due solely to the Pet, the new teaching aid has been met with great enthusiasm by teachers, students and parents alike.

Educational programs were written for the Pet by Thorwald Esbensen, president of Micro-Ed, Inc., based in Edina, a suburb of Minneapolis. In the fall of 1979, third and fifth grade students were given the Iowa Tests of Basic Skills and those who, on the basis of local norms, scored in the bottom quartile in the areas of capitalization, punctuation and English usage, and who were in schools having student support centers, were scheduled into these centers on a regular basis to receive microcomputer instruction. Student support centers were designed to help children in need of additional help with their studies. In the spring of 1980, these students were re-tested and considerable progress had been achieved.

Four of six elementary schools in Edina had established student support centers. The students usually spent from 20 to 30 minutes per session and were generally scheduled into the support center for one or two sessions per week. There are from two to six Pets in each center and also some scattered throughout the schools in individual classrooms.

Student support centers are staffed by para-professionals who are acquainted in a "nuts and bolts" way with what programs are available. There is one para-professional in each center and Esbensen works with them on a continuing basis.

All of the student programs were written for the 8K Pet with a cassette recorder. "They are on cassette because it would cost just as much to buy a whole new computer as it would to buy a disk drive," Esbensen said. There is also one printer in the central audio visual office for special purposes.

The tapes are self-contained and each stands alone, allowing interested users to build their own library of tapes. Most of the tapes sell for $7.95 each.

The 59 fifth grade students participating in the English usage program progressed 20 months over a seven month period. A group of 67 fifth graders concentrating on improving their punctuation skills also advanced 20 months within seven months. The 73 fifth graders who studied capitalization over this same period gained 25 months.

Third graders also concentrated on their studies with the computer for seven months: 35 students in English usage gained 27 months; 39 in punctuation progressed 31 months; and 43 in capitalization advanced 18 months.

"We do not make any kind of claim at all that these results were solely because we used micros," Esbensen said. "It's my strong feeling that any time that

the school system or a classroom zeros in on specific student needs or areas where they need help, giving the necessary time to adjust those weaknesses, and does so with appropriate materials, you can get very significant gains."

According to Esbensen, micros offer a golden opportunity to zero in on student needs. They can provide the additional time to the student without taking the classroom teacher away from the full group. The children also loved to work with the micros, Esbensen said. "Never was remedial instruction sought with such eagerness as with the micros."

Esbensen noted that he was careful not to portray the computers as competition for classroom teachers. In most instances the children were recommended for computer-assisted instruction by the teachers and were scheduled into the support centers at the convenience of their teacher. "We were very careful to avoid giving any impression that micros were somehow preferable to other teaching modes. We want micros to be the instructional allies of teachers," Esbensen said.

The Edina school system also offers an in-service computer training program for their teachers, taught by Esbensen. One two-day workshop is held for teachers in June as soon as school lets out. "It's a 'shake hands with a micro' kind of workshop where they get to know the micros as being friendly machines. They use many of the programs that we've developed locally and they can see how simple the micros are to use and how very interesting you can make a program," Esbensen said. In August they offer a similar kind of workshop for teachers, and in the fall Esbensen teaches a 12-week Pet programming workshop for a limited number of staff members. He also teaches a programming course for some of the elementary school students along with a community education class in micros.

Use of the Pets in this project has been funded totally by the Edina local budget. "We've had no special grants from anybody, no foundations, no special input on anything. We've done it all out of our own operating budget," Esbensen said. "When you have elementary school principals in this day of budget cutting, putting down micros as a first priority, you know that some interesting things are happening. That's the situation here."

— by Elli Holman

New Jersey Sales Center Demystifies Computers

Silent Partner, a new computer sales center in Fort Lee, NJ, is devoted to demystifying the computer. "We see our task as helping our customers solve problems by means of the microcomputer," says Peter Schwartz, president of Silent Partner. "We're dedicated to showing the average American — professionals, businessmen, students — how they can apply the microcomputer to business, education and personal matters." Besides microcomputers, Silent Partner also stocks complete lines of computer accessories and software, he added.

Silent Partner displays computer packages that are designed for specific business, educational and personal functions. They include a complete word-processing system, a business forecasting and projection system, a stock market information system, an educational system and a complete business operations system.

A fully equipped service department enables the firm to make installations and adjustments rapidly and efficiently.

A separate seminar room within the Fort Lee headquarters accommodates training sessions, demonstrations, videotape screenings and discussions of computer applications. Computer users clubs will also be invited to use the premises for their meetings.

"I think I'm ready to be replaced by a computer."

Home Time-Sharing Projections

Consumers are flocking to sign up for home time-sharing services, and there may be as many as 100,000, subscribers to these services by the end of 1981, according to a new 148-page report from International Resource Development Inc. There are currently two consumer time-sharing services in operation, with a combined total of about 8,000 users according to the report, which predicts entry into the market by several other "major" companies during the next three years. Total revenues generated from these services could exceed $1 billion per year before the end of the current decade, and most of these revenues will be derived from the use of computer and communications facilities which otherwise would have been idle during evenings and weekends.

Demand for the services recently has become so strong that the computer facilities have been overloaded, the report points out. However, both The Source and CompuServe are adding more computers and will be able to deal with the expected ten-fold expansion in the number of users over the next year or so.

The Source has reached an agreement with Tymshare, one of the largest commercial time-sharing companies, to use Tymshare's computers in off-hours; CompuServe has several more of its own computers which could be made available as its consumer business expands.

According to Charles W. Newton, project manager for the IRD study, "Tymshare has very cleverly positioned itself so as to obtain an inside view of the development of consumer time-sharing over the next three years, without needing to make a major commitment in terms of new computers and facilities." Newton views several other large time-sharing organizations, including General Electric Information Services and Boeing Computer Services, as possible entrants into the consumer time-sharing services market.

The IRD report predicts that several years will elapse before the market for consumer time-sharing services broadens beyond its current user base of computer hobbyists and affluent gadget-lovers. However, because the services are nationwide, these categories alone will provide good revenue growth to suppliers through 1985, according to the report. As Newton points out, "Of the expected 1 million home computer users, 10%, or only 100,000 users will be accessing the time-sharing services from the home in 1981."

In an interview program conducted during the study, the IRD researchers asked all of the leading commercial time-sharing vendors how they expected the consumer time-sharing market to develop

PROJECTED HOME TIME-SHARING MARKET THROUGH 1990

AVERAGE MONTHLY EXPENDITURES	1981	1984	1987	1990
		MILLIONS OF HOUSEHOLDS		
$10.00	.04	.25	1.00	3.5
$25.00	.03	.15	.60	1.3
$50.00	.02	.10	.30	.7
$75.00	.01	.05	.15	.2
$100.00		.03	.10	.2
NUMBER OF HOUSEHOLDS	100,000	580,000	2,150,000	5,900,000
ANNUAL EXPENDITURES	$30-35M	$175-200M	$700-750M	$1,500-1,750M

REASONS FOR USING HOME TIME-SHARING SERVICES

REASONS / SEGMENTS	APPLICATIONS PROCESSING	EDUCATION	ELECTRONIC MAIL	ENTERTAINMENT	INFORMATION SERVICES	PERSONAL COMPUTING	TRANSACTION SERVICES	WORD PROCESSING
TIMELINESS	X		X		X		X	
COST EFFECTIVENESS			X			X		
AVAILABILITY	X	X		X	X		X	X
FORMAT	X	X			X		X	
SOCIAL INTERACTION			X	X				
GROUP INFLUENCES	X	X		X	X	X	X	
SELF IMPROVEMENT		X			X	X		X
ENTERTAINMENT			X	X	X	X		

SOURCE: INTERNATIONAL RESOURCE DEVELOPMENT INC.

over the next five years; the response was about evenly divided between cautious optimism and downright skepticism, reports Newton.

Included in the report is an analysis of the demographics of current and potential future users of home time-sharing services, with detailed projections of the expected levels of utilization of informational, transactional and educational services offered by the time-sharing vendors. Noting that CompuServe was recently acquired by H&R Block, the tax-preparing services company, Newton speculates that Block may have in mind an interactive automated tax-preparation service offering, which could be programmed to minimize the user's taxes, while at the same time alerting the user to the percentage probability of an IRS audit. "Maybe we'll get to the point where Block's computers can outwit the IRS computers," comments Newton.

International Resource Development Inc. is an independent management consulting and market research firm, which has been studying the computer time-sharing market for the past nine years. In addition to several dozen multi-client research reports, IRD has undertaken individual client consulting assignments for such firms as General Electric, Boeing Computer Services, AT&T and University Computing. A free description and table of contents for the report (#155), entitled "Consumer Time-Sharing Services," is available from IRD at 30 High Street, Norwalk, CT 06851; (203) 866-6914.

QUBE Subscribers Have Access to Data Banks

Subscribers to Warner Amex Cable Communications Inc.'s two-way interactive QUBE service in Columbus, OH, will soon be able to retrieve information from data banks permitting a variety of consumer services including computer video games, stock market information, personal financial management and other services.

The service will begin this fall with a two-way interactive project by Warner Amex; Atari, Inc., a leading manufacturer of personal computer systems and a subsidiary of Warner Communications Inc.; and CompuServe Incorporated, a leading time sharing computer service company.

Atari is a leader in the home video games industry and the coin-operated games business. CompuServe has provided computer services for more than 10 years to some of the nation's largest business and government agencies. Headquartered in Columbus, OH, CompuServe is a subsidiary of H & R Block, Inc.

A minimum of 100 Atari personal computers will initially be installed in QUBE subscriber homes giving those subscribers access to data banks which are part of the CompuServe service. The service will be available to subscribers from 6 p.m. to 5 a.m. on business days and all day on weekends and holidays.

QUBE households participating in the project will have access to data which will convert their homes into information centers containing millions of facts from major information providers.

Through a cross-indexed information menu, subscribers will have at their fingertips computer video games, current financial and commodity news and diverse business analysis and money management information from some of the best financial sources available. Other data services may include:

- Full coverage of sporting events from around the country
- Consumer reports
- Airline and bus information schedules
- Emergency telephone numbers including health procedures and poison antidotes
- Employment listings, training opportunities and the teenage job market.

Preventing Stress-Induced Heart Attacks

Research that could lead to prevention of stress-induced heart attacks is being carried out at the University of Pittsburgh's Western Psychiatric Institute. Using a Digital Equipment Corporation MINC laboratory computer to control and analyze experiments, researchers are exposing volunteers to testing that places them under psychological stress. The test procedure may help to determine which influences in a stressful daily routine could adversely affect the human heart.

MINC is a modular computer system designed for laboratory applications. It incorporates special plug-in interfacing modules that enable a researcher to customize the system for specific experimental applications.

The experimental set-up, designed by J. Richard Jennings, Ph.D., involves volunteers listening to tones of slightly different pitches and acting on the basis of which tone is heard. The transmission rate, or schedule of times the tones are transmitted to the subjects' headphones, is controlled by the MINC system. When volunteers hear a tone, they have to decide whether it is the slightly higher or lower tone and press an appropriate button within a specific time interval. The order of tones is random, under computer control, and the tones are made difficult to hear by including noise in the earphones.

According to Dr. Jennings, the speed and accuracy of the responses are displayed to the subjects so that they can determine the quality of their actions. "We

vary the time interval in which a volunteer must respond so that some responses will be fast and inaccurate and others may be slow. All volunteers want to do well and some report emotional stress when asked to respond very quickly or slowly," he said.

Test results are evaluated to determine alterations in measurements such as rate of heart action and breathing. "We have known that there is a psychological component to some diseases," Dr. Jennings said. "The research we're doing is to determine components that may influence heart disease." He added that some of his test volunteers are businessmen who work in high-pressure situations.

"The MINC computer system is the major analytical element for our experimental program. In addition to controlling the experiments, the MINC does major analyses, both in Basic and Fortran. For some statistical work, we send the data to a DEC system-10 mainframe," Dr. Jennings said.

"Our immediate goal in these experiments has been to begin to understand the relationship between psychological stress and heart disease in certain personality types. It is possible that once this is understood, methods can be developed that will help minimize or prevent coronary disease for such people," he said.

☆☆☆ Announcements ☆☆☆

Computer News

Small Computer News, a new biweekly newsletter covering the microcomputer field, is written for the computer hobbyist, manufacturer and retailer. Each issue contains up-to-date information on happenings in the microcomputer business field, a new product previews, convention news and free-lance and career employment opportunities.

Charter subscriptions, including first class postage, are available for $24.50 per year from Edwards Publications, 78-56 86th Street, Flushing, NY 11385.

Educational Conference in Arizona

In January 1981 The College of Education at Arizona State University, Tempe, AZ, will host a special microcomputer conference designed to introduce educators to the many applications of micros in the classroom.

The goal of the conference is to provide an awareness of microcomputers and their impact on society. In addition, the ways micros are currently being used in education at the elementary and secondary levels, in the fine arts areas, in career and vocational education, and in special education, will be explored.

The conference will be held on the Arizona State University campus, Friday and Saturday, January 16 and 17, 1981. For further information and registration materials, contact Dr. Gary G. Bitter, Arizona State University, Payne 203, Tempe, AZ 85281.

Erie, PA Apple Club

The Erie Apple Crunchers computer club is made up of 30 Apple and Bell and Howell Apple owners and users. The aim of the group is to exchange programming ideas and concepts.

The club is developing a program library and is willing to exchange original programs with other users groups or individuals. Membership dues is $7.50 annually. The club hopes to provide a monthly newsletter. For more information contact the Erie Apple Crunchers Computer Club P.O. Box 1575, Erie, PA 16507.

A New Home

The Charles Babbage Institute for the History of Information Processing (CBI) has selected the University of Minnesota as its permanent home. CBI is a nonprofit foundation which promotes research on the history of computers and computation. CBI is currently located in Palo Alto, CA. For more information contact Mr. Paul Armer at (415) 328-0984.

Chicatrug

Chicatrug News, now in its third year of publication, provides monthly articles on items of interest to the TRS-80 user. A one-year subscription of twelve monthly issues is $12. For a free sample copy, write to E.B.G. & Associates, 203 N. Wabash, Suite 1510, Chicago, IL 60601, (312) 782-9750.

Virginia Hamfest

The Fifth Annual Tidewater Hamfest-Computer Show-Flea Market will be held in the Virginia Beach, Virginia, Arts and Conference Center, October 4 and 5 from 9 AM to 4 PM each day. Featured are ARRL, Traffic, DX, Technical Forums, XYL free bingo and lounge. Admission $3.50. There will be an advance ticket drawing for Kenwood FM transceiver. Flea market spaces are $3.00 a day. For tickets and information contact TRC P.O. Box 7101, Portsmouth, VA 23707; include SASE.

Unusual Application?

If you use your computer for an interesting application, why not write up a short (500 or 1000 words) article telling us about it? Send your submission to Random Access, *Personal Computing*, 1050 Commonwealth Ave., Boston, MA 02215.

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16K MEMORY UPGRADE KITS 2 for $85 $45

for TRS-80*, Apple II, (specify): **Jumpers** $2.50

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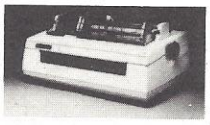

Letter Quality High Speed Printer
Includes TRS-80* interface software, quick change print fonts, 55 cps, bidirectional, high resolution plotting, graphing, proportional spacing: R.O. $2579
R.O. with Tractor Feed $2679 KSR with Tractor Feed $2995

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Same as Radio Shack line printer I

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730 CENTRONICS FRICTION & PIN FEED PRINTER $629
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P1 CENTRONICS PRINTER $269
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PAPER TIGER (IP440) $939
Includes 2K buffer and graphics option

TI-810 Faster than Radio Shack line printer III
Parallel and serial w/TRS-80* interface software with upper and lower case and paper tray $1599

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SIX (6) PRONG ISOLATOR $54.00
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PLASTIC DISKETTE HOLDER $ 8.00
RF MODULATOR: Adapts video to TV $35.00
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LEEDEX MONITOR Video 100 $119
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40 track, 102K Bytes. Fully assembled and tested. Ready to plug-in and run the moment you receive it. Can be intermixed with each other and Radio Shack drive on same cable. TRS-80* compatible silver enclosure. 90 day warranty. One year on power supply. **External card edge included.**

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CCI-189 5¼", 40 Track (102K Bytes) add-on drive $394
Z-87 Dual 5¼" add-on drive system $995

DISKETTES — Box of 10 (5¼") - with plastic library case $24
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ALTOS 64K, DD, SS, 2-Drive, 1MB $3995
TRS-80* Model II-64K $3499
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TRS-80* Expansion Interface $249
APPLE 16K $989
HEWLETT PACKARD HP-85 $2999
ZENITH Z89, 48K all-in-one computer $2555
ZENITH Z19 $740
TELEVIDEO 912B $745 920B $769
ATARI 400 $489 **ATARI 800** $769
APF M1000 $99 **IM-1** $499
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SOFTWARE FOR THE TRS-80* Software w/Manual

INTELLIGENT TERMINAL SYSTEM ST-80-III BY LANCE MIKLUS: Enables a TRS-80* to act as a dial-up terminal on any standard time sharing network. Provides a TRS-80* with control key, ESC Key, Repeat Key, Rub Out Key, Break Key, full upper and lower case support, selectable printer output and program selectable transmission rates $139

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INSEQ-80™: Indexed Sequential Access Method (ISAM) for the TRS-80 Model I. A must for anyone writing business programs. Eliminate wasted disk space from direct record processing. Split second access to any record. Access data records instantly via alpha/numeric "key" eg. Part NR, zip code or sequentially in ascending key sequence. Add/modify records in any order. Access up to three files per program — Files may be spread over multiple disks. Machine language processing from your basic program. Utility program to convert direct files to INSEQ-80 format. $49.95

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General Ledger $99
Accounts Receivable $99
Accounts Payable $99
Payroll $99
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INVENTORY Requires 32K, TRS-80, 1 drive $125
INSORT-80: Callable form BASIC via USR. Sorts "Random" Disk Files. "Disk" to "Disk" sort times — 350 records in 35 secs, 1000 records in 6 minutes, 3500 records in 12 minutes. Machine language processing. Up to 35 sort keys ascending/descending. Utility to build BASIC program. Runs under NEWDOS. $49.95

CP/M BASED SOFTWARE for Zenith, Altos, Radio Shack, Apple Software w/Manual

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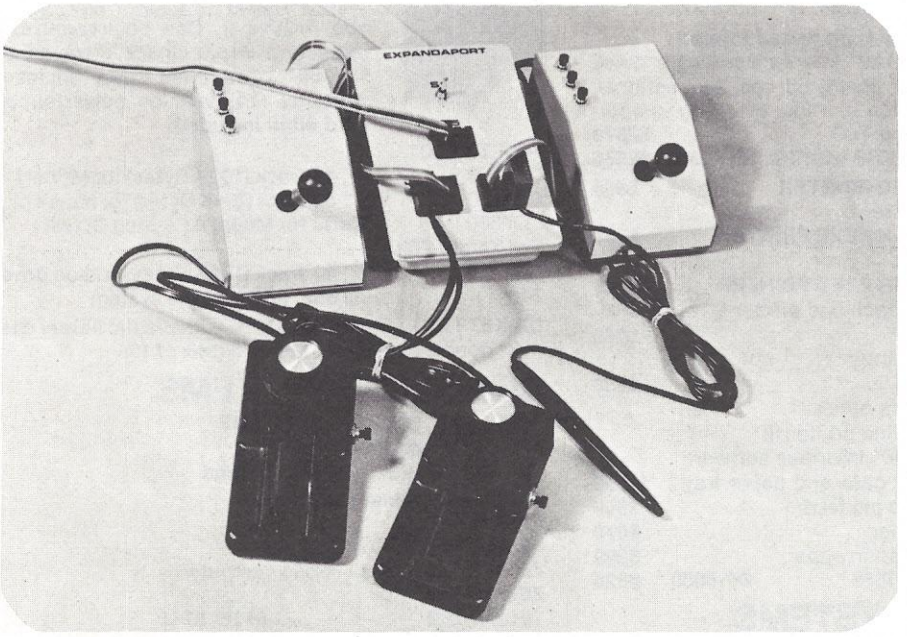
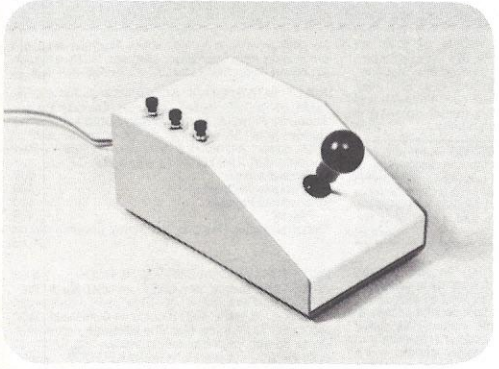
CIRCLE 10

JOYSTICK & EXPANDA-PORT FOR YOUR APPLE II® COMPUTER

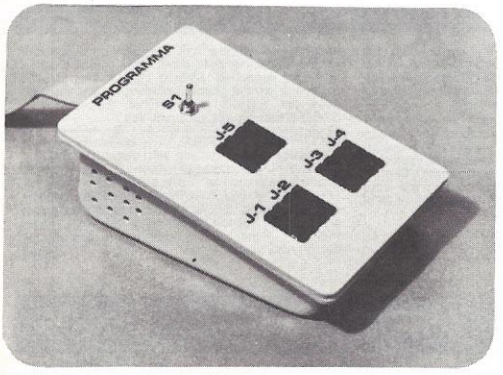


EVERY APPLE II® OWNER SHOULD HAVE ONE!



JOYSTICK $49.95

The PROGRAMMA JOYSTICK is an input peripheral that attaches to the APPLE II Computer's game I/0 Port. The JOYSTICK is a must for the serious game player, and it offers a degree of linearity not currently available with other joysticks. The ease of manueverability and the availability of the "functional" switches make the PROGRAMMA JOYSTICK a much needed enhancement to any APPLE II Computer System owner. The PROGRAMMA JOYSTICK comes completely assembled and tested.



EXPANDA-PORT $59.95

The PROGRAMMA EXPANDA-PORT is a multi-port expander for the game I/0 port of any APPLE II Computer System. In addition to allowing expansion for up to six devices, the EXPANDA-PORT contains a built-in speaker that replaces the function of the Apple II's speaker. The switch on the EXPANDA-PORT allow for the selection of the specific device desired and for the switching of that device. No unplugging of any device connected to the EXPANDA-PORT is required. The PROGRAMMA EXPANDA PORT comes completely assembled and tested.

The PROGRAMMA JOYSTICK and EXPANDA-PORT are available on a limited basis through your local computer dealer. Apple II is a registered trademark of Apple Computers, Inc.

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CIRCLE 11

GO FIRST CLASS

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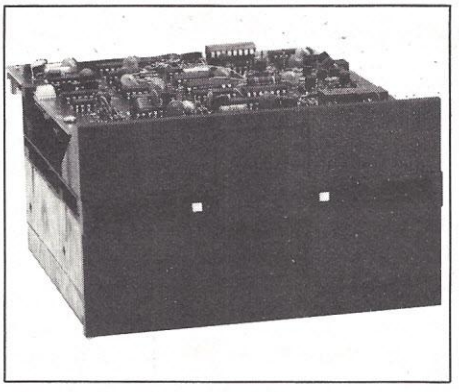
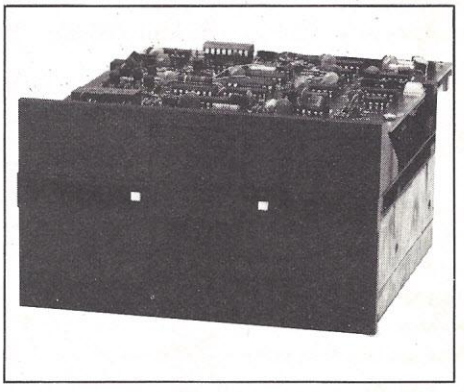
TPI: 96 or 100
Tracks per side:
80 maximum
Recording density:
5535 BPI
Access time:
• Track to track: 3ms
• Average: 90 ms





1 MByte
TM-100-4 (Double-sided)
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TPI: 96 or 100
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Recording density:
5877 BPI
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Heads Above The Rest in Disk Technology

CIRCLE 12

Small Computers Come To The Rescue of Big Business

BY WILLIAM R. PARKS

Big business and large institutions are discovering another side of computing — low-cost personal computers. Yes, the home computer is heading into the big business marketplace. Until recently big business depended on big computers and if there was a need for computer power in a distant department, a terminal was located in that department which would be "on-line" with the big computer.

Of course big computers require expensive hardware and high-paid programmers, and if the application in that distantly located department was relatively small, it was still treated as a major undertaking by the centralized data processing department. A "little" application became a big headache using costly equipment associated with big computer centers and a high budget for programming time and planning. This common experience inhibited many "little" programming projects or applications. If the central computing staff was busy with "big" projects, the smaller applications were delayed further.

Today there is a well defined trend toward decentralizing computer processing functions. At the lowest level it means placing terminals in far off places away from the center for data entry purposes. The next level of development is the recent increased use of minicomputers — smaller than big computers but still quite costly to maintain. At the next level we have a new trend to add still other devices within the computer communicaton network. Big business is actually adding "home" microcomputers. These "new" microcomputers have various names such as Apple, Pet and TRS-80, which are not so new to you and me, but they are new to the world of big business and I predict that the economics of the situation will force even greater use of them in the future. In other words don't be too surprised if the next time you go to the bank, you see a manager or teller key into an Apple II.

Use of home microcomputers in big business is a natural evolution from the "dumb" terminal to the "intelligent" terminal. A home computer can act like an intelligent terminal in nearly the same price range as the older popular CRT's with keyboards. Home computers can not only communicate with big computers (as the older CRTs did), but they can also "down-load" information. And even when the main computer is "down," the little computer sitting on the desk can continue to operate. In fact, some banking institutions recently announced that for certain limited but necessary applications, the stand-alone home microcomputer was better than the big centralized machine from an economic standpoint.

Economics will force even greater use of small computers in the future.

Such applications as figuring interest or answering questions during loan application procedures — where no record keeping is really involved — is best handled by "off-the-shelf" software packages. Inexpensive floppy disks are being used to store canned programs for answering general questions for prospective customers. You don't need an expensive big computer for many applications in industry and business.

You also don't need a big computer to keep track of some small files that a department manager might use such as index cards. However, the same manager might consider it very useful to store such minor information on floppies if a microcomputer terminal were available. He might use the micro a few minutes a day to take care of "small" applications. This is happening now and will continue as big business starts buying even more desk-top microcomputers instead of dumb terminals.

There is the story of the manager who used his own home computer to automate a number of functions at work that saved time and money. Top management was so impressed that they bought his home system, paid him for all the software and he had to go out and buy still another system for his home.

As the little computer gets more publicity and home use this tale will be repeated many times in countless offices throughout the world. What a way to get a pay raise! You might be able to do the same thing with your home system. Program it for work functions and then sell the software and the machine to your company. They will really appreciate your talents.

Large institutions such as colleges are also discovering the same kind of situation as described above in the world of big business. Students who use "smart" microcomputer terminals can switch off the big computer for game playing. The cost in savings for expensive big computer time on campus is almost justification alone for never buying dumb terminals anymore.

At one college, students are forbidden from playing games because the central big computer time is simply too expensive. The home computer terminal idea would take care of the needs of the disgruntled students at that campus. Also, the students can copy all their programs on simple floppy disks instead of bulky paper print-outs and the schools are in a position to purchase all the educational software available for class-use. When the student wishes to access a language system that is not available on the micro, he still has the option of switching on-line to the big system where more power is available.

Such developments will greatly enhance home computer hobbyists as candidates for positions in industry, education and business as their very own home systems become part of the networks found in organizations of tomorrow.

Professor Parks is in the Department of Mathematics and Computer Science at Elon College, Elon College, NC.

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OM2PC

Photograph by Robert Dibue

Income Statements

BY W.B. GOLDSMITH, JR.

There's nothing fascinating about an income statement. In times gone by, the income statement was called a "Profit and Loss" Statement or a "P and L" — and it was boring then, too. Money lenders, however, insist on seeing an income statement when a business owner requests a loan. The Internal Revenue Service has an annual Income Statement habit too. (For single owner businesses it's Schedule C of Form 1040; partnerships use Form 1065; and corporations use IRS Form 1120 to report income.)

The income statement is a summary of the dollars and cents operations for a business. It is a standardized format for reporting the money received and spent by a business where the famous "bottom line" is the profit or loss. Income statements always cover some time period, with the more common time chunks being three months ("Quarterly Statement") and one year ("Annual Statement"). Small businesses can generally satisfy the demands of taxing and regulatory agencies with one annual statement. However, there are no rules that say you can't prepare the statement more often, and I usually prepare monthly statements for my client businesses. Strangely, profits usually increase when a business owner pays attention to the regular Income Statement. (I said the statement is *boring*, not ***useless***).

I prepare a lot of these boring statements each year. Since my personal computer is the best tool available to relieve me of boring tasks, I wrote "Income Statement". With this program, the boredom has gone from preparing Income Statements.

"Income Statement" can help your "binary buddy" serve you better if you ever need to prepare income statements. Whether you make up a report for your own business, for someone else's or for your family budget, this program will save you time and trouble. Don't ignore this jewel just because you don't own a business. Smart business owners use their income statements to control and manage business costs — you can do the same thing for your family finances. With a slight change or two in the program, your personal computer can help you lick inflation.

User's Notes

As you can see from the Sample Run, this is an easy program to use. Once you type RUN, the program takes charge of asking for income and expense data. If you are familiar with the IRS's Schedule C, you'll recognize the program output. All of the categories of expense that are used on Schedule C are present in "Income Statement." (Well, almost. I omitted "Jobs Credit" and "WIN" credits because none of my clients with small businesses have employees.) The input prompts list all the possible expense categories. Any category answered with a zero ("0") is dropped from the printout to give you a more readable statement.

Two areas of operation beg a little special attention. The "Business Name" prompt will allow a two line business name entry. Enter the first line, then a comma (","), then the second line. At output time, the second line will be centered below the first. If your business name needs only one line, the program skips the centering and printing routine for the second.

In the "Other Expenses" category, the program has provisions for ten entries. (See the Programming Notes to expand this field.) For each entry, you should type a few-word category title, then a comma (",") and the expense amount. If you have fewer than ten "Other Expenses", just type anything for the last category and a zero ("0") for the amount. The prompting sequence will stop and, at printing time, only the "live" categories will be listed on your Income Statement. Both the two-line business name entry and the "Other Expenses" sequence are illustrated in the Sample Run.

When you've finished data entry, "Income Statement" asks what output device you'd like to use. When you select the output, the program asks you to "Press 'RETURN' to print" to allow you one last chance to energize your system printer and position the paper before the print routine begins. After each copy of your Income Statement is printed, you'll be asked if you want "Another Copy?" A "Yes" will put you in business for another output sequence. (Since my system printer is an aged TTY that produces one copy at a time, I need this feature for multiple copies.)

There it is. Like magic, your personal computer is turning out professional Income Statements.

Programming Notes

There are fewer than 170 lines of code in the Program Listing for "Income Statement". Don't be put off by the number — this is a deceptively powerful routine. You'll be well repaid for the few minutes spent typing these commands into your program memory. The Basic is SWTP 8K Version 2.0. Most other Basic's with string variables and matrix arithmetic capability should handle "Income Statement" readily. I used a couple of shortcuts that might

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Mr. Goldsmith, an aerospace engineer, is enrolled to practice before the Internal Revenue Service and is an active member of the National Society of Public Accountants. His previous PC *articles include "Rental Income" (July 1980), "Installment Sales" (August 1980) and "Reminder Lists" (September 1980).*

Sample Run

```
BUSINESS NAME? E.D.SAMPLE,RETAIL STORE
STATEMENT DATE? 31 DECEMBER 1980

GROSS RECEIPTS? 25132
RETURNS? 12
BEGINNING INVENTORY? 18512
PURCHASES? 8672
PERSONAL USE WITHDRAWALS? 0
COST OF LABOR? 0
MATERIALS AND SUPPLIES? 12
OTHER COSTS? 0
ENDING INVENTORY? 18103
OTHER INCOME? 133

LIST THE EXPENSES FOR:
ADVERTISING? 1534
AMORTIZATION? 0
BAD DEBTS? 0
BANK CHARGES? 84
CAR/TRUCK EXPENSE? 1522
COMMISSIONS? 0
DEPLETION? 0
DEPRECIATION? 2213
DUES/PUBLICATIONS? 155
EMPLOYEE BENEFITS? 0
FREIGHT? 0
INSURANCE? 289
INTEREST? 0
LAUNDRY/CLEANING? 0
LEGAL/PROFESSIONAL? 250
OFFICE SUPPLIES? 655
PENSION PLANS? 0
POSTAGE? 150
RENT? 1800
REPAIRS? 0
SUPPLIES? 319
TAXES? 586
TELEPHONE? 144
TRAVEL/ENTERTAINMENT? 0
UTILITIES? 137
WAGES? 0

OTHER EXPENSES:
    EXPENSE TYPE   AMOUNT
? MISCELLANEOUS, 113
? ,0

WHAT PORT FOR OUTPUT? 3
PRESS 'RETURN' TO PRINT?
```

Sample Income Statement

```
                    INCOME STATEMENT

                      E.D.SAMPLE
                     RETAIL STORE

                PERIOD ENDING 31 DECEMBER 1980

GROSS RECEIPTS                                    $ 25132.00
LESS RETURNS AND ALLOWANCES                            12.00
                                                  ----------
BALANCE                                           $ 25120.00
BEGINNING INVENTORY          $ 18512.00
PURCHASES                       8672.00
MATERIALS AND SUPPLIES            12.00
                             ----------
SUBTOTAL                     $ 27196.00
ENDING INVENTORY               18103.00
                             ----------
COST OF GOODS SOLD                                     9093.00
                                                  ----------
GROSS INCOME                                      $ 16027.00
OTHER INCOME                                           133.00
                                                  ----------
TOTAL INCOME                                      $ 16160.00


    EXPENSES
ADVERTISING                  $ 1534.00
BANK CHARGES                    84.00
CAR/TRUCK EXPENSE             1522.00
DEPRECIATION                  2213.00
DUES/PUBLICATIONS              155.00
INSURANCE                      289.00
LEGAL/PROFESSIONAL             250.00
OFFICE SUPPLIES                655.00
POSTAGE                        150.00
RENT                          1800.00
SUPPLIES                       319.00
TAXES                          586.00
TELEPHONE                      144.00
UTILITIES                      137.00
MISCELLANEOUS                  113.00
                             ----------
TOTAL EXPENSES                                         9951.00
                                                  ----------
NET PROFIT FOR PERIOD                             $  6209.00
                                                  ==========
```

appear puzzling at first glance, but we'll explore them fully here.

The first fourteen lines of our program (lines 10 through 140) are the title block and definition statements. Line 80 gives our program full control of the output format by defeating an automatic CR-LF sequence in the SWTP Basic. The DIGITS=2 in line 90 specifies that two digits are to be printed after the decimal point for all numerics. Your Basic may have different commands to accomplish these goals, so feed your machine its favorite grammar.

The function definition statements in lines 100 to 130 simplify the TAB arguments used later in the print section. The entire semi-elaborate TAB computations insure that the decimal points line up in the output. Again, your Basic may have a different method for printing right-justified columns of numbers.

Statement 140 dimensions the main matrix variable, E(X), and asks the computer to reseve the appropriate amount of memory. The Basic in my personal computer defaults all undimensioned matrices to a size of ten. (Anything larger *must* be dimensioned to avoid an error message; anything smaller may be dimensioned to save memory.) Since the "Other Expense" variables, E$(X) and F(X), use a ten-slot matrix, they are not dimensioned here. If you decide to expand the "Other Expense" category you may need to add dimension information for the expense name and amount variables.

After lines 150 through 180 tell you what program is running, the serious business of "Income Statement" data collecting begins. Lines 200 and 210 allow entry of the business name and the date of the statement (last day of the accounting period reported). Two variables are used in line 200 to permit input of a two-line business name. (See the Sample Run for an example.) One label is used for the statement date, so don't put a commas (",") anywhere in the date — the comma is a terminator for a variable.

Gross income and inventory figures are input in lines 240 through 340. Some of the variables are added and some subtracted later when we get to the mathematical part of our statement, so if you decide to leave any of these variables out, retain the proper variable tag.

Expense information is entered in statements 360 to 490. There are two separate collection routines — one for "regular" expenses and one for the "other" business costs. Both use a FOR/NEXT loop structure. for regular expenses, the titles for the expense categories are stored in the DATA statements of lines 2000 to 2080. As each lap through the loop is run, the READ E$ in line 380 picks up another title. The expense amount entry is stored in the E(X) matrix. For other expenses, we can't read the names of the expenses so provision is made to store these in matrix F(X). Lines 430 and 440 provide an operator cue to the proper entry order. Statement 470

Program Listing

```
0010 REM ********************************
0020 REM *       INCOME STATEMENT       *
0030 REM ********************************
0040 REM *      COPYRIGHT 1980 BY:      *
0050 REM *     W. B. GOLDSMITH, Jr.     *
0060 REM *     LAKEWOOD, CA   90712     *
0070 REM ********************************
0080 LINE= 0
0090 DIGITS= 2
0100 DEF FNA(X)=(50-LEN(STR$(X)))
0110 DEF FNB(X)=(66-LEN(STR$(X)))
0120 DEF FNC(X)=(64-LEN(STR$(X)))
0130 DEF FND(X)=(48-LEN(STR$(X)))
0140 DIM E(26)
0150 PRINT
0160 PRINT "INCOME STATEMENT"
0170 PRINT
0180 PRINT
0190 REM ** HEADER INFORMATION ********************
0200 INPUT "BUSINESS NAME",N$,M$
0210 INPUT "STATEMENT DATE",D$
0220 PRINT
0230 REM ** INCOME INFORMATION **********************
0240 INPUT "GROSS RECEIPTS",I(1)
0250 INPUT "RETURNS",I(2)
0260 INPUT "BEGINNING INVENTORY",I(3)
0270 INPUT "PURCHASES",I(4)
0280 INPUT "PERSONAL USE WITHDRAWALS",I(5)
0290 INPUT "COST OF LABOR",I(6)
0300 INPUT "MATERIALS AND SUPPLIES",I(7)
0310 INPUT "OTHER COSTS",I(8)
0320 INPUT "ENDING INVENTORY",I(9)
0330 INPUT "OTHER INCOME",I(10)
0340 PRINT
0350 REM ** COLLECT THE EXPENSES ******************
0360 PRINT "LIST THE EXPENSES FOR:"
0370 FOR X=1 TO 26
0380 READ E$
0390 PRINT E$;
0400 INPUT E(X)
0410 NEXT X
0420 PRINT
0430 PRINT "OTHER EXPENSES:"
0440 PRINT TAB(5);"EXPENSE TYPE";TAB(20);"AMOUNT"
0450 FOR X=1 TO 10
0460 INPUT E$(X),F(X)
0470 IF F(X)=0 THEN X=10
0480 NEXT X
0490 PRINT
0500 REM ** SELECT OUTPUT PORT ********************
0510 INPUT "WHAT PORT FOR OUTPUT",P
0520 INPUT "PRESS 'RETURN' TO PRINT",Z$
0530 PORT= P
0540 REM ** PRINT THE INCOME STATEMENT *************
0550 PRINT
0560 PRINT TAB(28);"INCOME STATEMENT"
0570 PRINT
0580 PRINT TAB(INT((72-LEN(N$))/2));N$
0590 IF M$="" THEN 610
0600 PRINT TAB(INT((72-LEN(M$))/2));M$
0610 PRINT
0620 PRINT TAB(INT((58-LEN(D$))/2));"PERIOD ENDING
     ";D$
0630 PRINT
0640 PRINT
0650 PRINT
0660 REM ** RECEIPTS & INVENTORY ******************
0670 PRINT "GROSS RECEIPTS";
0680 PRINT TAB(FNC(I(1)));"$ ";I(1)
0690 PRINT "LESS RETURNS AND ALLOWANCES";
0700 PRINT TAB(FNB(I(2)));I(2)
0710 PRINT TAB(56);"----------"
0720  I1=I(1)-I(2)
0730 PRINT "BALANCE";
0740 PRINT TAB(FNC(I1));"$ ";I1
0750 PRINT "BEGINNING INVENTORY";
0760 PRINT TAB(FND(I(3)));"$ ";I(3)
0770 PRINT "PURCHASES";
0780 PRINT TAB(FNA(I(4)));I(4)
0790 IF I(5)=0 THEN 820
0800 PRINT "LESS COST OF PERSONAL WITHDRAWALS";
0810 PRINT TAB(FND(I(5)));" (";I(5);")"
0820 IF I(6)=0 THEN 850
0830 PRINT "COST OF LABOR";
0840 PRINT TAB(FNA(I(6)));I(6)
0850 IF I(7)=0 THEN 880
0860 PRINT "MATERIALS AND SUPPLIES";
0870 PRINT TAB(FNA(I(7)));I(7)
0880 IF I(8)=0 THEN 910
0890 PRINT "OTHER COSTS";
0900 PRINT TAB(FNA(I(8)));I(8)
0910  I2=I(3)+I(4)-I(5)+I(6)+I(7)+I(8)
0920 PRINT TAB(40);"----------"
0930 PRINT "SUBTOTAL";
0940 PRINT TAB(FND(I2));"$ ";I2
0950 PRINT "ENDING INVENTORY";
0960 PRINT TAB(FNA(I(9)));I(9)
0970 PRINT TAB(40);"----------"
0980  I3=I2-I(9)
0990 PRINT "COST OF GOODS SOLD";
1000 PRINT TAB(FNB(I3));I3
1010 PRINT TAB(56);"----------"
1020  I4=I1-I3
1030 IF I(10)=0 THEN 1090
1040 PRINT "GROSS INCOME";
1050 PRINT TAB(FNC(I4));"$ ";I4
1060 PRINT "OTHER INCOME";
1070 PRINT TAB(FNB(I(10)));I(10)
1080 PRINT TAB(56);"----------"
1090  I=I4+I(10)
1100 PRINT "TOTAL INCOME";
1110 PRINT TAB(FNC(I));"$ ";I
1120 PRINT
1130 PRINT TAB(5);"EXPENSES"
1140 REM ** EXPENSES ********************************
1150 RESTORE : REM ** RESET THE DATA POINTER ******
1160  Z=0: REM ** SET FLAG FOR "$" PRINTING *******
1170  E=0
1180 FOR X=1 TO 26
1190 READ E$
1200 IF E(X)=0 THEN 1280
1210  E=E+E(X)
1220 PRINT E$;
1230 IF Z>0 THEN 1270
1240 PRINT TAB(FND(E(X)));"$ ";E(X)
1250  Z=Z+1
1260 GOTO 1280
1270 PRINT TAB(FNA(E(X)));E(X)
1280 NEXT X
1290 FOR X=1 TO 10
1300  E=E+F(X)
1310 IF F(X)=0 THEN 1340
1320 PRINT E$(X);
1330 PRINT TAB(FNA(F(X)));F(X)
1340 NEXT X
1350 PRINT TAB(40);"----------"
1360 PRINT "TOTAL EXPENSES";
1370 PRINT TAB(FNB(E));E
1380 PRINT TAB(56);"----------"
1390  B=I-E
1400 IF ABS(B)=B THEN 1530
1410  B=ABS(B)
1420 PRINT
1430 PRINT "NET LOSS FOR PERIOD";
1440 PRINT TAB(FNC(B));"$(";B;")"
1450 PRINT TAB(56);"==========="
1460 PRINT CHR$(12): REM ** FORM FEED TO TTY ******
1490 PORT= 1
1500 INPUT "ANOTHER COPY",Z$
1510 IF LEFT$(Z$,1)="Y" THEN 520
1520 END
1530 PRINT "NET PROFIT FOR PERIOD";
1540 PRINT TAB(FNC(B));"$ ";B
1550 GOTO 1450
2000 DATA "ADVERTISING","AMORTIZATION","BAD DEBTS"
2010 DATA "BANK CHARGES","CAR/TRUCK EXPENSE","COMMISS
     IONS"
2020 DATA "DEPLETION","DEPRECIATION","DUES/PUBLICATIO
     NS"
2030 DATA "EMPLOYEE BENEFITS","FREIGHT","INSURANCE"
2040 DATA "INTEREST","LAUNDRY/CLEANING","LEGAL/PROFES
     SIONAL"
2050 DATA "OFFICE SUPPLIES","PENSION PLANS","POSTAGE"
2060 DATA "RENT","REPAIRS","SUPPLIES"
2070 DATA "TAXES","TELEPHONE","TRAVEL/ENTERTAINMENT"
2080 DATA "UTILITIES","WAGES"
```

provides for early termination of the FOR/NEXT loop when you run out of expenses before the program runs out of NEXTs. To increase the possible number of categories, change the FOR X=1 TO 10 to accommodate the number of expenses you expect and redimension E$(X) and F(X) as mentioned.

Lines 500 to 530 allow run-time selection of the output device and the "one-more-chance" to energize the printer. If your printer and your control terminal are the same, you can delete these lines with no ill effects on "Income Statement."

Lines 540 and 650 enclose the routine that provides the header for your output statement. The TAB functions in 580, 600 and 620 center the messages on my 72-column TTY. If your printer has a different column count, you'll want to change these. You may also want to change the functions defined in 100 to 130 to provide a more balanced looking statement. Statement 590 guides the program flow around the print of the second line in the business name if there is no second line. If you don't mind an extra line space or two on your statement you could delete 590.

Printing and calculation of the receipts and inventory data is interspersed from line 660 to 1120. The arithmetic is pretty straightforward here. Since I wanted all income section variables to carry an "I" tag, things may be a little confusing. As you trace through this area, remember that "I(1)" is a different item than "I1". The functions we defined in the program preamble are used in the TABs for the first time here. Use of the functions really cuts down the time and error opportunities of keypunching.

Expenses are calculated and printed next. The RESTORE of line 1150 resets the Basic data pointer so we can use the list of expense names in line 2000. to 2080 again. Line 1160 carries a reset for a flag that causes the "$" to be printed only before the first numerical entry in the column. 1170 initializes "E" which will be used to collect the expense total. The FOR/NEXT of lines 1180 to 1280 does the work of printing the non-zero expense categories and amounts. Statement 1200 takes care of suppressing those expenses titles with zero costs entered. The first time that any expense is printed, Z=0 and line 1240 will cause the "$" to precede the cost amount. Line 1250 increments Z to insure that the next time through the loop 1270 handles the printing chores. It takes a few extra commands just to put that dollar sign in its proper place once. The extra trouble is repaid by the professional appearance given to your income statement by that touch. Line 1210 is used to collect the total expenses in variable "E".

Other expenses are printed in the same column by 1290 to 1340. Again, a FOR/NEXT cycles through the matrix variables. Line 1300 continues to amass expense totals and 1310 lets our program suppress the zeroes.

The "B" (for Bottom Line) in line 1390 is our profit or loss number. If the business shows a profit for the period, line 1400 sends program execution to the "NEXT PROFIT FOR PERIOD" printing command. If we had a loss, lines 1410 through 1440 take care of tagging and printing. The "B=ABS(B)" of line 1410 gets rid of the minus sign attached to the loss. Accountants are used to seeing losses enclosed by brackets or parentheses (because carbon paper doesn't know whether you're writing with a red pen or a black one — and a minus sign could be a "dash" or flyspeck). The printing statement in 1440 takes care of the brackets for our business loss.

CHR$(12) in statement 1460 provides a form feed to my TTY to ready the printer for another statement. Check your printer's instructions to verify that it will recognize one of these before trying to print it. (If yours is a really off-beat printer CHR$(12) might be a self-destruct signal.) PORT=1 in line 1490 is another command for SWTP systems. The control terminal is located at Port #1 and by returning control we can have the "Another Copy?" question printed on the video terminal instead of the client's income statement. You may wish to change THEN 520 in statement 1510 to THEN 510 to allow selection of different output devices on each output run. (You could let the first print sequence display on your video terminal, for example, to check that data entry was complete before printing.)

Whether you prepare income statements for your own business, for your family or as a business, "Income Statement" can take the routine work out of your task. It will provide a uniform format for your accounting statements that will help brand your product "professional." You can customize the program to add a signature block at the bottom of the page, a letterhead at the top or a different mix of expenses in the middle. If this program does no more than take some of the mystery out of the business bookkeeping jargon, it's worth adding to your program library. □

Computer-Assisted Grading

BY REGINALD D. GATES

No matter how test grades are assigned, someone will be unhappy. One problem teachers face is that there are two completely different approaches to determining the grades for an exam. Grades are either based on performance against an absolute standard (90% or above is an A) or by relative performance within a group (the three highest scores will be As). If the teacher uses the "absolute" approach, the fairness of the standard is always in question. If the "relative" approach is chosen, an excellent grade may be awarded for mediocre performance in a sub-normal class.

Most teachers would like to use a combination of the two approaches but find the computations involved in the relative or "curve" method both time-consuming and boring. Here's where your computer can be of great help. Once the test scores are entered, the computer can quickly do the statistical calculations and suggest grades based on both approaches.

This grading program was developed to assist a teacher in determining letter grades for a set of papers. Three basic assumptions underly the program's design. First, both absolute performance and relative performance need to be considered. Second, the process of assigning grades is actually an iterative process. That is, the teacher will try various "cut-off limits" to obtain a good grade distribution. Third, the teacher should have the final say in what the grades will be. A good grade distribution is one that satisfies the teacher, not one that meets some abstract mathematical test.

The program begins by gathering some title information, the class size and the number of questions on the test. Next, the students' scores are input. As each score is entered, it is edited and an "absolute" grade determined immediately. When a score of zero is entered, you are asked if all scores have been input. If so, the program provides you with the opportunity to review and revise the entries. Once you are satisfied that the scores are correct, the program calculates the mean and standard deviation for the input data and assigns grades as follows (see also Figure 1):

- Any grade >= (mean + 2 standard deviations) = A
- Any grade >= (mean + 1 standard deviation) = B
- Any grade >= (mean − 1 standard deviation) = C
- Any grade >= (mean − 2 standard deviations) = D
- Any grade < (mean − 2 standard deviations) = F

Now the iterative process begins. You are shown a graph displaying the distribution of scores on a percentage right basis from 100% to 35%. In the upper right corner of the graph the number of students receiving each grade under both approaches is shown. In the lower right hand corner is displayed the "cut-off limits" used in both approaches.

Now review the graphs and displays. The program asks if you are ready to assign grades or if you wish to change the limits. If you elect to change the cut-off points for the grades, the program obtains the new data, recalculates the grades and redisplays the graph.

Once you are happy with the distribution of grades, the program cycles

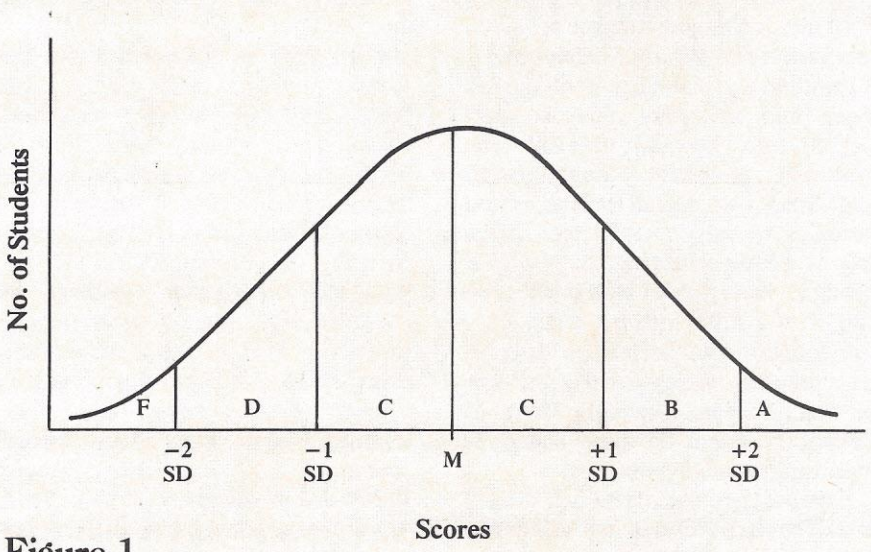


Figure 1

Assume we graph the number of students achieving a given score versus the scores themselves. If we have a perfectly designed test and an absolutely normal class, the resulting graph will be the "bell-shaped" curve above. This figure can be completely described with only two mathematical values, the mean and the standard deviation.

The mean for a set of scores is simply the average. The standard deviation is a measure of the dispersion of scores about the mean. It tells us how the scores are distributed with respect to the average. The standard deviation is calculated as follows:

$$SD = \sqrt{\frac{\Sigma(x-m)^2}{n}}$$

SD = Standard Deviation
x = score
m = mean
n = number of scores
Σ = "the sum of"

It can be shown mathematically that 67% of the area under the curve is within plus or minus one SD of the mean and that 94% is within plus or minus two SDs. If we use these points as the dividing lines for our grading, then 3% of the students will fail and 3% will get As.

through the scores as input. The score is displayed along with the suggested grade for each entry. The program waits after each display so the grade may be written on the test papers.

This program does not replace the teacher or the teacher's judgment. It does relieve some of the tedious work so additional time is available for the more important aspects of teaching.

Program Notes

The program is written in Digital Group Maxi-Basic 2.0. Where possible, I've avoided commands unique to this implementation of Basic. However, the following comments may be helpful.

- The pound sign (#) is used as an abbreviation for PRINT.
- %3I;T9 means "print the field T9 in a formatted manner as a three-digit integer".
- The maximum class size is currently set at fifty but may be revised as desired.
- The program uses the function SORT to compute the square root.
- Almost all calculations are rounded to an integer result. □

Program Listing

```
10 REM ***** GRADE1            BY R. D. GATES ******
20 REM *****              VER 1.0
30 GOSUB 1000 : REM INIT
40 GOSUB 2000 : REM GET SCORES
50 GOSUB 3000 : REM ADJ AND CALCULATE
60 REM **** LOOP UNTIL USER HAPPY WITH GRADES
70 GOSUB 4000 : REM CALC REL GRADES
80 GOSUB 5000 : REM PRT GRAPH
90 INPUT "DO YOU WISH TO CHANGE LIMITS (Y/N) ",Q$
100 IF Q$="Y" THEN GOSUB 6000 : GOTO 60
110 GOSUB 7000 : REM PRT GRADES
120 #"" : #".. GOODBYE ..";FREE(0)
199 END
400 REM SUBR TO TEST A NUM IN L1
405 REM L2=LOWER LIMIT,L3=UPPER LIM, AND NUM MUST
    BE INTEGER
410 REM L4 SET TO 1 IF ERROR
415 IF L1<>INT(L1) THEN L4=1 : GOTO 480
420 IF L1<L2 THEN L4=2 : GOTO 480
430 IF L1>L3 THEN L4=3 : GOTO 480
440 L4=0 : GOTO 499
480 #".. ERR ";
482 IF L4=1 THEN #" NOT AN INTEGER"
483 IF L4=2 THEN #" LESS THAN ";L2
484 IF L4=3 THEN #" LARGER THAN ";L3
485 L4=1
499 RETURN
1000 REM INITIALIZE, ETC
1010 DIM N3(5),N4(5)
1020 DIM G$(5) : G$="ABCDF"
1030 DIM G3$(50),G4$(50)
1040 DIM B$(50),A$(50)
1050 DIM T$(25)
1055 DIM Q$(1)
1060 G3$=" " : G4$=" "
1070 B$=" " : A$="*"
1080 T$=" "
1090 FOR I=1 TO 6
1100   G3$=G3$+G3$ : G4$=G4$+G4$
1110   B$=B$+B$ : A$=A$+A$
1120   T$=T$+T$
1130   NEXT I
1140 DIM I1(15),S3(50)
1150 DIM P3(50)
1200 FOR I=1 TO 16 : #"" : NEXT I
1210 #"==================================="
1220 #"            GRADE1"
1230 #"==================================="
1240 FOR I=1 TO 8 : #"" : NEXT I
1250 #".. PLEASE SUPPLY CLASS TITLE ";
1260 INPUT T$
1270 #""
1280 #".. PLEASE GIVE THE MAXIMUM POSSIBLE SCORE
    FOR THE TEST";
1290 INPUT N2
1300 L1=N2 : L2=1 :L3=9999 : GOSUB 400
1310 #"..      MAXIMUM NUMBER OF SCORES = 50"
1320 #""
1330 REM SET PERCENT LIMITS  90=A, 80=B,70=C, ETC
1340 P1(1)=90 : P1(2)=80 : P1(3)=70
1350 P1(4)=60 : P1(5)=50
1399 RETURN
2000 REM GET SCORES FROM USER
2010 #" .. PLEASE INPUT SCORES AS NUMBER RIGHT "
     : #""
2020 L2=0 : L3=2
2030 E1=0
2035 N1=N1+1
2040 REM *** LOOP UNTIL END FLAG IS ON
2050   #" PAPER NO ";N1;" SCORE ";
2060   INPUT1 L1
2070   GOSUB 400
2080   IF L4=1 THEN 2050
2090   IF L1=0 THEN GOSUB 2200 ELSE GOSUB 2400
2100   IF E1=0 THEN N1=N1+1 : GOTO 2040
2110 #"..";N1;" SCORES INPUT"
2199 RETURN
2200 REM TEST FOR END OF SCORES
2205 #""
2210 INPUT "ALL SCORES ENTERED (Y/N)",Q$
2220 IF Q$="Y" THEN E1=1 : N1=N1-1 : GOTO 2299
2230 GOSUB 2400 : REM STORE 0 SCORE
2299 RETURN
2400 REM FOUND A GOOD SCORE ,NOW TO STORE IT
2410 S3(N1)=L1
2420 T9=INT(100*(L1/N2))
2430 P3(N1)=T9
2435 T8=0
2440 FOR I=5 TO 1 STEP -1
2450   IF T9>=P1(I) THEN T8=I
2460   NEXT I
2465 IF T8=0 THEN T8=5
2470 G3$(N1,N1)=G$(T8,T8) : REM LETTER GRADE FOR
    PER
2490 #" - PER ";%3I;T9;" = GRADE ";G$(T8,T8)
2495 N3(T8)=N3(T8)+1
2499 RETURN
3000 REM ADJUST SCORES IF DESIRED AND CALC MEAN,
     SD
3010 #"" : INPUT "DO YOU WISH TO REVIEW THE
    SCORES (Y/N)",Q$
3020 IF Q$="Y" THEN GOSUB 3600
3030 REM CALC SCORE PER INTERVAL, TOTAL SCORE
3035 T9=0
3040 FOR I=1 TO N1
3050   T1=T1+S3(I)
3060   T9=21-INT(P3(I)/5)
3070   IF T9> 15 THEN T9=15
3080   I1(T9)=I1(T9)+1
3090   NEXT I
3100 REM CALC MEAN,SD AND LIMITS FOR SCORES
3110 T9=0
3120 A1=INT((T1/N1)+.5)
3130 FOR I=1 TO N1
3140   T9=(S3(I)-A1)*(S3(I)-A1) + T9
3150   NEXT I
3160 A2=INT(SQRT(T9/N1)+.5)
3170 L5(1)=A1+2*A2
3180 L5(2)=A1+1*A2
3190 L5(3)=A1-A2
3200 L5(4)=A1-2*A2
3210 L5(5)=0
3220 FOR I=1 TO 5
3230  P4(I)=INT(100*(L5(I)/N2)) : NEXT I
3299 RETURN
3600 FOR X1=1 TO N1
3610   #"PAPER ";%3I;X1;" SCORE ";%3I;S3(X1);
3620   #"  -  IS THIS RIGHT (Y/N) "; : INPUT Q$
3625   IF Q$="Y" THEN 3680
3630   #" CORRECT SCORE " ; :INPUT L1
3640   L2=0 : L3=N2 : GOSUB 400
3650   IF L4=1 THEN 3630
3660   N9=N1 : N1=X1 : GOSUB 2400
3670   N1=N9
3680   NEXT X1
```

continued

```
3699 RETURN
4000 REM CALC CURVE GRADES BASED ON L5 LIMITS
4020 FOR X1=1 TO N1
4030   GOSUB 4400
4040   G4$(X1,X1)=G$(T9,T9)
4050   N4(T9)=N4(T9)+1
4060   NEXT X1
4099 RETURN
4400 T9=0
4410 FOR I=5 TO 1 STEP -1
4420   IF S3(X1)>=L5(I) THEN T9=I
4430   NEXT I
4440 IF T9=0 THEN T9=5
4499 RETURN
5000 FOR X1=1 TO 15
5010   GOSUB 5100
5020   GOSUB 5200
5030   GOSUB 5500
5040   #""
5050   NEXT X1
5099 RETURN
5100 REM PRT LINE HEADING
5110 IF X1=1 THEN #"100"; : GOTO 5199
5120 #%3I;(100-5*(X1-1));
5199 #" "; : RETURN
5200 REM PRT ASTERISKS BASED ON INTERVAL COUNT
5210 T9=50-I1(X1)
5220 IF I1(X1)>0 THEN #A$(1,I1(X1));
5230 IF T9>0 THEN #B$(1,T9);
5240 #" ";
5299 RETURN
5500 REM PRT RIGHT HAND PORTION
5510 IF X1=1 THEN #" ABS REL"; : GOTO 5599
5520 IF X1=7 THEN #" LIM LIM"; : GOTO 5599
5525 IF X1=13 THEN #" NO  ";%3I;N1; : GOTO 5599
5526 IF X1=14 THEN #" SD  ";%3I;INT(100*(A2/N2))
     ; : GOTO 5599
5527 IF X1=15 THEN #" AVG ";%3I;INT(100*(A1/N2))
     ; : GOTO 5599
5530 IF X1>7 THEN GOSUB 5700 : GOTO 5599
5540 REM PRT TOP PORTION
5550 T8=X1-1
5560 #G$(T8,T8);%3I;N3(T8);
5570 #" ";%3I;N4(T8);
5599 RETURN
5700 REM PRT BOTTOM PORTION
5710 T8=X1-7
5720 #G$(T8,T8);
5730 #%3I;P1(T8);" ";
5740 #%3I;P4(T8);
5799 RETURN
6000 REM CHANGE REL GRADING LIMITS
6010 #""
6020 FOR I=1 TO 5
6030 #" GRADE ";G$(I,I);" OLD LIMIT ";
6040 #%3I;P4(I);
6050 #"  -  NEW LIMIT ";
6060 INPUT L1
6070 IF I>1 THEN L3=L5(I-1) ELSE L3=100
6080 GOSUB 400
6090 IF L4=1 THEN 6050
6100 P4(I)=L1
6120 L5(I)=INT((N2*(L1/100))+.5)
6130 NEXT I
6140 REM RESET NO OF GRADES FOR REL
6150 FOR I=1 TO 5
6160   N4(I)=0 : NEXT I
6199 RETURN
6300 P4(I)=L1
6310 L5(I)=INT((N2*(L1/100)+.5)
6399 RETURN
7000 #"" : #""
7010 FOR X1=1 TO N1
7020 #"NO ";%3I;X1;
7030 #" SCORE ";%3I;S3(X1);
7040 #"   PER ";%3I;P3(X1);
7050 #"     ";
7060 #"SUGGESTED GRADE (ABS) ";G3$(X1,X1);
7070 #"  (REL) ";G4$(X1,X1)
7080 #""
7090 INPUT "HIT CR WHEN READY ",Q$
7100 NEXT X1
7199 RETURN
READY
```

Sample Run

```
==================================
            GRADE1
==================================

.. PLEASE SUPPLY CLASS TITLE ?TEST CLASS 1

.. PLEASE GIVE THE MAXIMUM POSSIBLE SCORE FOR
   THE TEST?100

..      MAXIMUM NUMBER OF SCORES = 50

 .. PLEASE INPUT SCORES AS NUMBER RIGHT

 PAPER NO  1 SCORE ?70 - PER  70 = GRADE C
 PAPER NO  2 SCORE ?78 - PER  78 = GRADE C
 PAPER NO  3 SCORE ?95 - PER  95 = GRADE A
 PAPER NO  4 SCORE ?87 - PER  87 = GRADE B
 PAPER NO  5 SCORE ?44 - PER  44 = GRADE F
 PAPER NO  6 SCORE ?67 - PER  67 = GRADE D
 PAPER NO  7 SCORE ?72 - PER  72 = GRADE C
 PAPER NO  8 SCORE ?60 - PER  60 = GRADE D
 PAPER NO  9 SCORE ?97 - PER  97 = GRADE A
 PAPER NO  10 SCORE ?75 - PER  75 = GRADE C
 PAPER NO  11 SCORE ?88 - PER  88 = GRADE B
 PAPER NO  12 SCORE ?55 - PER  55 = GRADE F
 PAPER NO  13 SCORE ?71 - PER  71 = GRADE C
 PAPER NO  14 SCORE ?83 - PER  83 = GRADE B
 PAPER NO  15 SCORE ?66 - PER  66 = GRADE D
```

```
 PAPER NO  25 SCORE ?71 - PER  71 = GRADE C
 PAPER NO  26 SCORE ?52 - PER  52 = GRADE F
 PAPER NO  27 SCORE ?82 - PER  82 = GRADE B
 PAPER NO  28 SCORE ?73 - PER  73 = GRADE C
 PAPER NO  29 SCORE ?90 - PER  90 = GRADE A
 PAPER NO  30 SCORE ?74 - PER  74 = GRADE C
 PAPER NO  31 SCORE ?0
ALL SCORES ENTERED (Y/N)Y
.. 30 SCORES INPUT


DO YOU WISH TO REVIEW THE SCORES (Y/N)N
100                                    ABS REL
 95 **                                 A  5   0
 90 ***                                B  6   6
 85 **                                 C 11  19
 80 ****                               D  4   4
 75 ****                               F  4   1
 70 *******                             LIM LIM
 65 ***                                A 90 101
 60 *                                  B 80  88
 55 **                                 C 70  62
 50 *                                  D 60  49
 45                                    F 50   0
 40 *                                   NO   30
 35                                     SD   13
 30                                     AVG  75
DO YOU WISH TO CHANGE LIMITS (Y/N) Y

 GRADE A OLD LIMIT 101  -  NEW LIMIT ?95
 GRADE B OLD LIMIT  88  -  NEW LIMIT ?85
 GRADE C OLD LIMIT  62  -  NEW LIMIT ?70
 GRADE D OLD LIMIT  49  -  NEW LIMIT ?55
 GRADE F OLD LIMIT   0  -  NEW LIMIT ?50
100                                    ABS REL
 95 **                                 A  5   2
 90 ***                                B  6   5
 85 **                                 C 11  15
 80 ****                               D  4   6
 75 ****                               F  4   2
 70 *******                             LIM LIM
 65 ***                                A 95  95
 60 *                                  B 80  85
 55 **                                 C 70  70
 50 *                                  D 60  55
 45                                    F 50  50
 40 *                                   NO   30
 35                                     SD   13
 30                                     AVG  75
DO YOU WISH TO CHANGE LIMITS (Y/N) N
```

```
NO   1 SCORE  70   PER  70     SUGGESTED GRADE (ABS) C   (REL) C

HIT CR WHEN READY
NO   2 SCORE  78   PER  78     SUGGESTED GRADE (ABS) C   (REL) C

HIT CR WHEN READY
NO   3 SCORE  95   PER  95     SUGGESTED GRADE (ABS) A   (REL) A

HIT CR WHEN READY
NO   4 SCORE  87   PER  87     SUGGESTED GRADE (ABS) B   (REL) B

HIT CR WHEN READY
NO   5 SCORL  44   PER  44     SUGGESTED GRADE (ABS) F   (REL) F

HIT CR WHEN READY
NO   6 SCORE  67   PER  67     SUGGESTED GRADE (ABS) D   (REL) D

HIT CR WHEN READY
NO   7 SCORE  72   PER  72     SUGGESTED GRADE (ABS) C   (REL) C

HIT CR WHEN READY
NO   8 SCORE  60   PER  60     SUGGESTED GRADE (ABS) D   (REL) D

HIT CR WHEN READY
NO   9 SCORE  97   PER  97     SUGGESTED GRADE (ABS) A   (REL) A

HIT CR WHEN READY
NO  10 SCORE  75   PER  75     SUGGESTED GRADE (ABS) C   (REL) C

HIT CR WHEN READY
NO  11 SCORE  88   PER  88     SUGGESTED GRADE (ABS) B   (REL) B

HIT CR WHEN READY
NO  12 SCORE  55   PER  55     SUGGESTED GRADE (ABS) F   (REL) D

HIT CR WHEN READY
NO  13 SCORE  71   PER  71     SUGGESTED GRADE (ABS) C   (REL) C

HIT CR WHEN READY
NO  14 SCORE  83   PER  83     SUGGESTED GRADE (ABS) B   (REL) C

HIT CR WHEN READY
NO  15 SCORE  66   PER  66     SUGGESTED GRADE (ABS) D   (REL) D
```

```
HIT CR WHEN READY
NO  21 SCORE  74   PER  74     SUGGESTED GRADE (ABS) C   (REL) C

HIT CR WHEN READY
NO  22 SCORE  69   PER  69     SUGGESTED GRADE (ABS) D   (REL) D

HIT CR WHEN READY
NO  23 SCORE  59   PER  59     SUGGESTED GRADE (ABS) F   (REL) D

HIT CR WHEN READY
NO  24 SCORE  81   PER  81     SUGGESTED GRADE (ABS) B   (REL) C

HIT CR WHEN READY
NO  25 SCORE  71   PER  71     SUGGESTED GRADE (ABS) C   (REL) C

HIT CR WHEN READY
NO  26 SCORE  52   PER  52     SUGGESTED GRADE (ABS) F   (REL) F

HIT CR WHEN READY
NO  27 SCORE  82   PER  82     SUGGESTED GRADE (ABS) B   (REL) C

HIT CR WHEN READY
NO  28 SCORE  73   PER  73     SUGGESTED GRADE (ABS) C   (REL) C

HIT CR WHEN READY
NO  29 SCORE  9 ?  PER  9 ?   SUGGESTED GRADE (ABS) A   (REL) B

HIT CR WHEN READY
NO  30 SCORE  74   PER  74     SUGGESTED GRADE (ABS) C   (REL) C

HIT CR WHEN READY

.. GOODBYE .. 4311
READY
```

Radio Shack Announces Three New Computers

BY KEN MAZUR

Three entirely new computer systems were recently announced by Radio Shack, the largest single seller of personal comuters, expanding the company's line of TRS-80 Model I and Model II systems. The new units are a Model III, a TRS-80 Pocket Computer and a TRS-80 Color Computer.

Most powerful of the three is the Model III, featuring a 65-key keyboard, 12-inch monitor, power supply and integral housing for two optional disk drives.

The unit will be offered in a number of configurations, with a 4K Level 1 Basic system selling for $699. A 16K version with Model III (*not* Level III) Basic will be priced at $999; it features upper and lower case, plus a real-time clock for performing control functions. The computer is expandable to a 32K business system that includes two double-density, 40-track disk drives. The business system is in turn expandable to 48K ($119 for 16K RAM upgrade) with four disks (two are external to the system). The business system retails for $2495.

The Model III has a dual-speed cassette interface that operates at either 500 or 1500 baud and the unit is compatible for the most part with Model I software. Other features include an expanded character set in the Model III Basic, keyboard control screen printing that allows you to print the video display to hard copy, repeating keys and a video that produces crisp characters.

The system has both a parallel interface and RS-232C serial interface. The RS-232C is included in the business system version of the unit but may be purchased for the other configurations for an additional $24.95.

Although the Model III can be purchased with no drives or two drives, a system can be upgraded for use with one disk unit at a cost of $849, which includes the controller.

Available for the new system is Personal Software's VisiCalc, selling for $99.95 on disk.

At the other end of the product line (in physical size) is the new TRS-80 Pocket Computer. In a full-page advertisement in the *Wall Street Journal,* Radio Shack touted its small machine by stating, "We've added a TRS-80 Pocket Computer that is a sensational 'first' on the market. Our experts say its Basic language makes it easier to program and more versatile than a programmable calculator, and we feel this TRS-80 newcomer makes the pre-today programmable calculator (cf. TI, HP, ours, etc.) about as state-of-the-art as a celluloid collar. A portable, pocketable miracle with an entry level price of $249."

The Pocket Computer, less than 7 inches long and weighing 6 ounces, contains 11K ROM and 1.9K non-volatile RAM. It is reputed to be able to do many of the smaller jobs that the TRS-80 Model I can do. In Pocket Computer Basic you get 10-digit accuracy, 15 arithmetic functions, 24 commands and editing. Basic resides in 7K of the ROM with the remaining 4K devoted to a monitor that features an editor and debug capabilities, according to a Radio Shack representative. Program statements, which are keyed in in normal fashion, are stored in compressed format in the unit to conserve programming space.

The small machine operates in four modes: Program Mode, Run Mode, Define Mode and Reserve Mode. In Program Mode, you enter your Basic program or LIST a program resident into the machine. A cursor moves across the display and enables you to edit your program. The Run Mode operates like that of the larger members of the Radio Shack computer family and is used to RUN a program.

Using the Define Mode, you can access any given portion of a program by using a technique of labeling. In the technique, you can label sections of a program (or label an entire program when you have more than one in the unit) by use of special label keys. The process is similar to the GOTO statement in Basic programming.

The Reserve Mode lets you set aside a portion of memory in which you can place subroutines that may be common to several related programs. The subroutines can be accessed from Basic. The subroutines remain in the memory (as do your Basic programs) even when the machine is turned off and are cleared from memory with the NEW command.

More than one program can be stored in memory simultaneously through use of the CLOAD command. If a second

program (or more) is too large to fit into memory already holding one or more programs, the Pocket Computer will display an error message; resident programs will not be affected.

The Pocket Computer video display is a 5 × 7 dot-matrix LCD readout that shows 24 characters at a time. Cursor control allows scrolling for program lines that take over 24 characters. The additional characters are contained in an 80-character buffer that has a manual playback feature. The unit cannot PRINT over 24 characters. Graphics are not supported.

External program storage can be achieved through an optional cassette interface that provides entry of Radio Shack's library of software or storage of user-programmed material. The cassette interface consists of a plastic-like frame that cradles the computer. The computer is connected to the frame; and the frame, in turn, is attached to a cassette recorder. For tape storage, you may use either a standard cassette recorder similiar to that used by the TRS-80 Model I or you may purchase a Miniset Recorder that is about the size of a book (1 5/16″ × 6 3/16″ × 4 9/16″). The interface will retail for $49 and the Miniset Recorder will cost $79.95.

Power for the various components of the system comes from batteries. The computer uses four camera-type mercury batteries with a rated life expectancy of 300 hours. The cassette interface requires three AA batteries and the Miniset Recorder needs four AA batteries.

Software packages for the new machine include Civil Engineering ($24.95), an aviation package ($24.95), Math Drill ($14.95), a games package ($14.95), Business Statistics ($19.95), Business Finance ($19.95), Personal Finance ($19.95) and Real Estate ($24.95).

Radio Shack also enters the world of color capability with its TRS-80 Color Computer. The unit features instant-load Program Paks (ROM cartridges) that enable you to instantly program the system for a variety of educational and recreational purposes.

The new color system (which has a 6809E microprocessor) comes in several configurations, with prices starting at $399. The entry level machine has a 53-key keyboard, 4K RAM, 8K ROM color Basic, an RS-232C expansion port, and a built-in connection to any television. For an additional $119 the machine can be upgraded internally to 16K RAM and another $99 will outfit the machine with 16K ROM extended color Basic, The 16K extended color Basic version as a package sells for $599.

For video output, the system may be attached to any television set (color or black and white) or may be used with Radio Shack's color TV as the monitor. The Radio Shack 13″ color TV retails separately for $399.

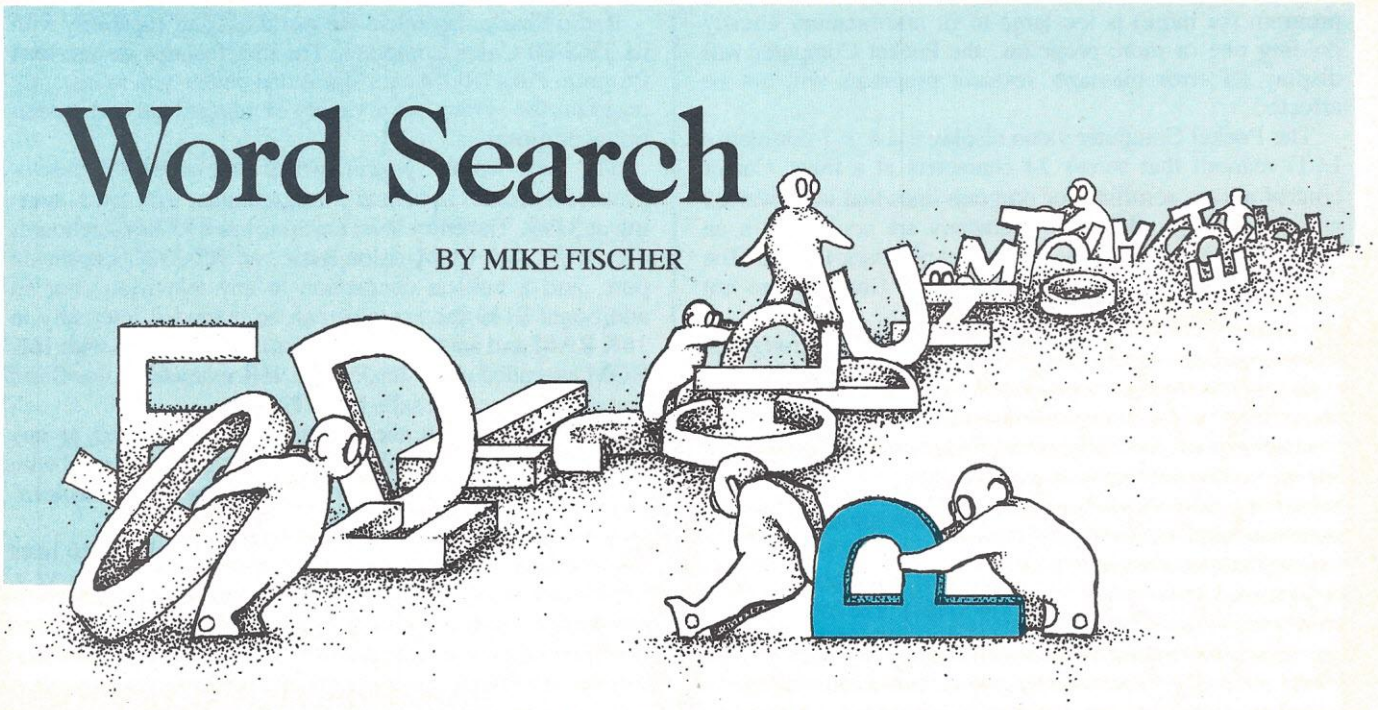
Under normal operation the video display shows 16 lines by 32 characters. In color mode, resolution ranges from 32 × 64 with eight colors to 192 × 256 with one foreground color and one background color. A company representative said even higher resolution is possible under assembly language programming.

Peripherals for the system consist of a cassette recorder that is available immediately. Disk drives, a printer and a modem are to be released soon. Joystick controls are priced at $25.

Radio Shack already has eight Program Paks: Chess, Quasar (a space game), Pinball, Football, Checkers, Personal Finance, Math Bingo and Music. The prices for the pre-packaged software range from $30 to $40 each. □

Word Search

BY MIKE FISCHER



You've just sat down at your computer to do some serious work (after all, the Federation *needs* you to track down the Klingons) when your children come in. Of course, they want to play with the computer too.

"Just one game," you tell them. But usually that one game is either too long or too difficult or it doesn't really satisfy them.

This program is your answer. It uses little computer time but generates a game that should keep your children busy and away from the computer for some time. The program develops and prints a word search puzzle on your printer.

For those of you who don't have children addicted to this game, a word search is a two-dimensional array of seemingly random letters. Hidden among the letters are words in a straight line — either up, down, across, back or in one of the four diagonal directions. Accompanying the array is a list of words hidden in it.

This program, written in Applesoft Floating Point Basic on an Apple II with DOS 3.2, uses about 6K for program storage and an additional amount of RAM for storing variables and strings. A 40 × 40 search will run on an 48K Apple II with Applesoft in ROM and DOS booted.

With a few minor changes (indicated in the discussion of the program lines) the program should run on any system using Microsoft Basic. Systems using a Basic which doesn't have the LEFT$, MID$ and RIGHT$ functions will have to make adjustments in lines 520, 530, 540, 1340, 1350 and 1360.

Systems that require dimensions for the length of a string (as opposed to the number of strings in an array) should also modify line 1060. If your system does not allow string arrays then you will have to extensively rewrite and limit the program to make it work.

How to Use the Program

Enter the coding and run. On an Apple II, the program first asks you for the peripheral slot in which your printer is located. Next the program asks for the width of your printer, the width and

Sample Run 1

```
                WORD SEARCH
          COPYRIGHT (C) 1980
                    BY
              MIKE FISCHER
          PRINTS A WORD SEARCH
SPACE TO CONTINUE...'ESC' TO END
PRINTER SLOT NUMBER IS: 1
MAXIMUM PRINTER WIDTH IS: 63
HOW MANY LETTERS WIDE SHOULD THE SEARCH BE? 25
HOW MANY LETTERS LONG SHOULD THE SEARCH BE? 25
WHAT PERCENT OF THE LETTERS OF THE
SEARCH SHOULD BE WORDS? 20
ENTER WORD: MICROCOMPUTER
ENTER WORD: BAUD
ENTER WORD: INTERFACE
ENTER WORD: BYTE
ENTER WORD: RAM
ENTER WORD: ROM
ENTER WORD: PROGRAM
ENTER WORD: BASIC
ENTER WORD: SERIAL
ENTER WORD: MODEM
ENTER WORD: MINIFLOPPY
ENTER WORD: PASCAL
ENTER WORD: ACCUMULATOR
ENTER WORD: REGISTER
ENTER WORD: APPLE
ENTER WORD: STRING
ENTER WORD: VARIABLE
ENTER WORD: DIMENSION
ENTER WORD: PRINT
THAT'S ENOUGH WORDS.
PLEASE WAIT WHILE I WORK.


TURN ON PRINTER.
PRESS ANY KEY WHEN READY.
```

Illustration by Jacky Brill

Sample Run 1 continued

Word Search

```
IDWQEYTKSOQWYNLBHHZUNZNQL
XLPTMKHKDZRBTLEMCAXVIXBEW
WBAQTSAAQIGVXPMAHMEMDZHUS
BNSYDRLECDGJCODDXIDLMZXKI
BWCUOEJXVAHDDRBDHCHZCCBTQ
KOAMCOULTTUEGRYBFRPQSFCNB
PVLKBXMMUTMNJPDRSOIWEILIY
MWIICWAMNHIHPOUAQCAZSXIRT
ALEPKXAGFRDOZQFKTOZAJAMPE
TUXLAWAKTKLDARNXSMBVUEMUW
LFMVPORSKFQZORKEGPHDLMNEG
NSKZCPLCIWIGEGRFAUWALLSNR
JBCRDOANHDRGBIAWJTGXEKILT
TLMKQGIFKAIFAVBJBEXLQFJBI
ZEQFHMGSMSYLWALAQRBYOAZRX
GLBLJFWETENYVGUGUAEPRCAUR
LUWATXTEDMCMCDZKIDYIOMAET
QQNEAURHGNYLAWERXEZEZXEPG
ICADIAJNHLGNAIAZIWZKXEFSX
JROTALUMUCCAZVYLOAQYSSLHR
VNOISNEMIDXUVGWXPCRUICEKQ
HIZRVXYEDYSRRSAIKXIWARMVP
NBANOWUVLIMVZZJDBLBCOMMFE
ZCNDMWGVJXRTLLDOTTLBZMMPV
FHRKINTERFACERMZASJZXFAVP
```

Words

```
MICROCOMPUTER
BAUD
INTERFACE
BYTE
RAM
ROM
PROGRAM
BASIC
SERIAL
MODEM
MINIFLOPPY
PASCAL
ACCUMULATOR
REGISTER
APPLE
STRING
VARIABLE
DIMENSION
PRINT
```

Answer

```
.........................
..P......................
..A...........M..M.......
..S..R.......O...I.......
..C.O.......D....C.....T.
..AM.......EG.Y..R....CNB
..L.......MN.P...O...I.IY
..........I.P....C..S..RT
..E......R.O..P..O.A...PE
...L....T.L..R..SMB......
....P..S.F..OR.E.P.......
.....P..I..GE.R..U.......
......AN..RG.I...T..E....
......I..AI.A...BE.L.....
.....M..MS.L...A.RB....R.
........T.....U..A....A..
.......E.....D..I....M...
......R........R.........
..............A..........
.ROTALUMUCCA.V...........
.NOISNEMID...............
.........................
.........................
.........................
....INTERFACE............
```

Sample Run 2

Word Search

```
K A V X Z H Q K R J D K C C M X E C R E
L Z K A B K V L B E Y U H R N X W M N O
K J N Z F H G W X M A E I L E F M G Y U
B A S I C V P J X W O K O O B F E E K O
P F O R T R A N E U I I Z C T M K N V Z
O U P B Y H J R G O N X E K L L K C X K
Y S S Y L O B O C M T B D W A M P S I L
Y A I T W F S U T L E S K K C B S E G V
M U K Y U H S M M P R U K C S R Y P A U
L V I D X R H R O S F G E R A T U T T F
K F F N O I E H S X A G Y U P I M F E A
D W P N D T F H J B C J B N R F O I T S
L G V Z U E C P P R E X O J V R R E Y S
K N X P I K B W Z E J C A L T N D U J E
T R M O C O M U W T M R R H A W U M D M
R O Z I U J U M G N A Z D A S M N J K B
C X G N X G N V M I R X Z W E M R S C L
E R J C F X V T K R M Y A D H G I U L E
I Q W L G Y I M U P P A O A E D Y I I R
D L F Y L N W Z U Y K M M H I I W G B S
```

Words

```
BYTE
RAM
ROM
COMPUTER
INTERFACE
DISK
MODEM
KEYBOARD
PRINTER
CRT
BASIC
PASCAL
LISP
FORTH
FORTRAN
COBOL
ASSEMBLER
DEBUG
```

Answer

```
. . . . . . . . . . . . . . . . . . . .
. . . . . . . . . . . . . . . . . . . .
. . . . . . . . . . . . . . . . . . . .
B A S I C . . . . . . . . . . . . . . .
. F O R T R A N . . I . . . . . . . . .
. . . . . . . . . . N . . . L . . . . .
. . . . L O B O C . T . . . A . P S I L
. . . . . . . . . . E . . . C B . . . .
. . . . . . . . . . R . K . S . Y . . .
. . . . . . . R . . F . E . A . . T . .
. . . . . . E . . . A . Y . P . M F E A
. . . . D T . . . . C . B . . . O . . S
. . . . U E . . . R E . O . . R R . . S
. . . P . . B . . E . . A . T . . . . E
T . M . . . . U . T M . R H . . . . . M
R O . . . . . . G N A . D . . M . . K B
C . . . . . . . . I R . . . E . . S . L
. . . . . . . . . R . . . D . . I . . E
. . . . . . . . . P . . O . . D . . . R
. . . . . . . . . . . M . . . . . . . .
```

Figure 1

```
        472 IF ASC (MID$ (A$,A,1)) = M(R,C) THEN 480
        474 A = L : NEXT A : GOTO 400
        550 M(R,C) = ASC (MID$ (A$,A,1)) : ON X GOSUB 300,
310, 320, 330, 340, 350, 360, 370
        1330 IF M(R,C) > 0 THEN 1370
```

Figure 2

```
        1040 IF SW > 9 AND SL > 9 AND SW < = PW/2 THEN
1060
        1050 PRINT "DIMENSIONS MUST BE AT LEAST 10 AND" :
PRINT "WIDTH MUST BE LESS THAN "; INT (PW/2) + 1 : GOTO
1010
1420 HTAB (PW-SW*2)/2 + 1 : PRINT M$(A) : PRINT
1480 FOR A = 1 TO SL : HTAB (PW-SW*2)/2 + 1
1411 A$ = M$(A) : M$(A) = ""
1412 FOR Y = 1 TO LEN (A$)
1413 M$(A) = M$(A) + MID$ (A$,Y,1) + " "
1414 NEXT Y
1415 M$(A) = LEFT$ (M$(A),LEN (M$(A))-1)
1481 A$ = N$(A) : N$(A) = ""
1482 FOR Y = 1 TO LEN (A$)
1483 N$(A) = N$(A) + MID$ (A$,Y,1) + " "
1484 NEXT Y
1485 N$(A) = LEFT$ (N$(A),LEN (N$(A))-1)
1486 PRINT N$(A) : PRINT : NEXT A
```

length of the search (in number of letters), and the percentage of the search that should contain words.

The search must be at least 10 letters wide and 10 letters long and no wider than your maximum printer width. The maximum percentage of words the search can contain is 25%. This rather arbitrary limit was chosen so that the computer would not run too long in trying to fit all the words into a search. You can modify line 1070 to permit a higher percentage.

The program next asks you to enter words to be placed in the search. You can input the words in any order. The longest word does not have to be given first.

After each word is entered, the program tells you if the word is too long to fit or if the maximum percentage has been reached. It then asks you to wait and goes to work putting the words in the search.

When all the words have been placed in the search (a 20 × 20 search with 15% words averages two minutes running time), the computer prompts you to turn on your printer. It then prints the search, the words in the search, and the answer.

The finished search is designed to be centered on the printer page. Thus, if your screen display is not the same width as your printer the search may be off center or broken up on your screen display.

How the Program Works

Line 10 resets the Apple screen to normal. It should be modified or deleted by non-Apple users.

Line 20 clears the screen (HOME; TRS-80 users should use CLS) and sets up a title page display in lines 5000 to 5090. The format for the title page is that used by the San Francisco Apple Core. The GET command in line 5060, similar to the INKEY$ command in TRS-80 Level II Basic, permits entry of any single character without hitting Return. CHR$(27) in line 5070 is ASCII "Escape" on the Apple II.

Lines 30 to 40 are only for Apples with printer interface cards in one of the peripheral slots. Others should delete these lines and modify lines 1390 and 1490 to call whatever printer driver routine their system uses.

Line 50 skips over the subroutines to the beginning of the program. The subroutines are placed near the start of the program for increased execution speed.

(The program uses several nested FOR...NEXT loops. For ease of following the coding I have not eliminated the variable name for the NEXT statements, although this would also speed up the program.)

Line 1000 clears the screen and gets the maximum printer width. The "D$=" command sets up a control character for use with Apple II DOS and should be deleted by non-Apple II DOS users. If you don't want printer portability, line 1000 can be changed to assign PW a value equal to your maximum printer width.

Lines 1010 to 1080 get the various search dimensions, check them for validity, and dimension the arrays used. (See variable listing in lines 5100 to 5610 of the program.)

Lines 1100 to 1150 get the words for the search, check that they aren't too long, and let you know when the computer has enough words for the array.

Lines 1160-1210 initialize the numeric checking array and the search string array.

Lines 1220 to 1280 place each word in the search array, starting with the largest word and working down to the smallest. The subroutine called by line 1260 starts by selecting at random one of eight directions for the word (line

400) and a random starting point (lines 420 to 430). It next checks that the starting point will leave enough room for the direction it has selected (lines 440 and 100 to 290).

The program then saves the starting row and column (line 450) and checks that the word won't overwrite part of another word already entered in the array (lines 460 to 490 and 300 to 370). The word is then entered into the array in lines 500 to 570.

Lines 1290 to 1370 save a copy of the search array with just the words entered into it as an answer, and place random letters in the blank spaces in the other array.

Line 1380 clears the screen and prompts you to turn on the printer. The POKE command clears the keyboard strobe on the Apple. Without the POKE, if you pressed a key after entering the last word (line 1150), the computer would use that key as C$ and continue right through to line 1390 without waiting for you. Non-Apple users should delete or modify the POKE and GET commands.

Line 1390 is the output to printer routine for Apple DOS with a printer card in a peripheral slot. Modify as needed for your printer driver routines.

Lines 1400 to 1430 print the search. The HTAB commands in lines 1400 and 1420 center the printing. If your computer does not recognize HTAB, or if your printer does not respond to HTAB, then substitute PRINT TAB(...) for HTAB and delete the "+1" from each calculation from these lines and lines 1440 to 1480.

Lines 1440 to 1450 print the words in the search and lines 1460 to 1480 print the answer.

Modifications

Two modifications can be made to the program. The first permits two words to share the same letters in the search. To do this add lines 472 and 474 and change lines 550 and 1330 as shown in Figure 1.

The second modification spreads out the printing of the array at a sacrifice of 1/2 of the maximum width of the array. However the final printed product is far easier to use. To make this change modify lines 1040, 1050, 1420, and 1480 and add lines 1411 to 1415 and 1481 to 1486 as shown in Figure 2. □

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Program Listing

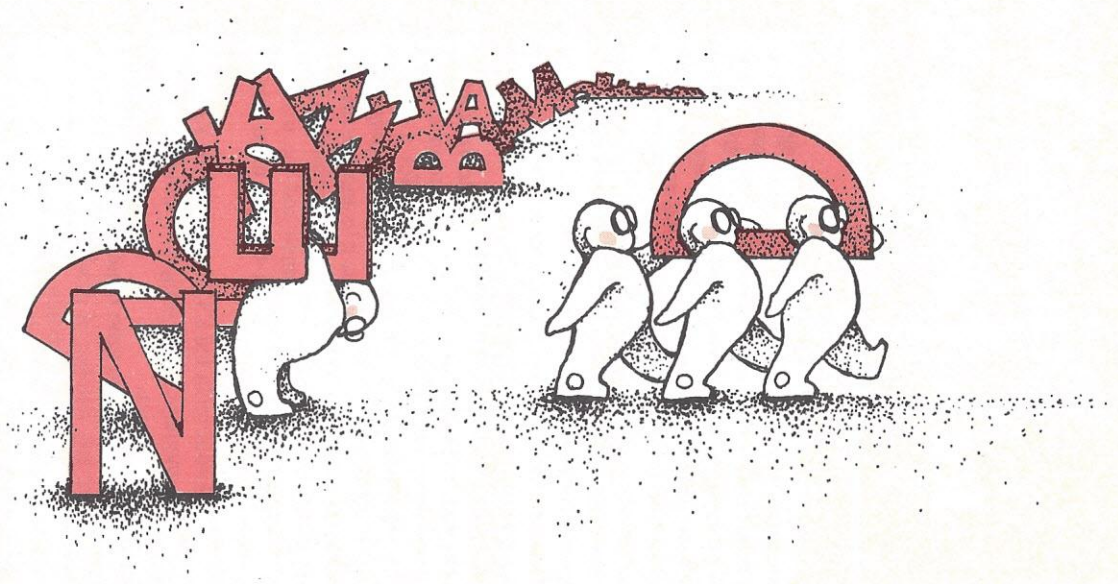
```
10   POKE 16298,0: TEXT
20   HOME : GOSUB 5000
30   HOME : INPUT "PRINTER SLOT NUMBER IS: ";PS
40   IF PS > 7 OR PS < 1 OR PS <  > INT (PS)
       THEN  PRINT "PRINT SLOT MUST BE A WHOLE
       NUMBER": PRINT "BETWEEN 1 AND 7.": FOR
       A = 1 TO 1000: NEXT A: GOTO 30
50   GOTO 1000
100   IF R + L > SL THEN 400
110   IF C + L > SW THEN 400
120   GOTO 450
130   IF R - L < 1 THEN 400
140   IF C - L < 1 THEN 400
150   GOTO 450
160   IF R + L > SL THEN 400
170   IF C - L < 1 THEN 400
180   GOTO 450
190   IF R - L < 1 THEN 400
200   IF C + L > SW THEN 400
210   GOTO 450
220   IF R + L > SL THEN 400
230   GOTO 450
240   IF R - L < 1 THEN 400
250   GOTO 450
260   IF C + L > SW THEN 400
270   GOTO 450
280   IF C - L < 1 THEN 400
290   GOTO 450
300  R = R + 1:C = C + 1: RETURN
310  R = R - 1:C = C - 1: RETURN
320  R = R + 1:C = C - 1: RETURN
330  R = R - 1:C = C + 1: RETURN
340  R = R + 1: RETURN
350  R = R - 1: RETURN
360  C = C + 1: RETURN
370  C = C - 1: RETURN
400  X =  INT (8 *  RND (1) + 1)
410  L =  LEN (A$)
420  R =  INT (SL *  RND (1) + 1)
430  C =  INT (SW *  RND (1) + 1)
440   ON X GOTO 100,130,160,190,220,240,260,280
450  RS = R:CS = C
460   FOR A = 1 TO L
470   IF M(R,C) = 1 THEN A = L: NEXT A: GOTO 400
480   ON X GOSUB 300,310,320,330,340,350,360,370
490   NEXT A
500  R = RS:C = CS
510   FOR A = 1 TO L
520   IF C < 2 THEN M$(R) =  MID$ (A$,A,1) +
      RIGHT$ (M$(R),SW - 1): GOTO 550
530   IF C = SW THEN M$(R) =  LEFT$ (M$(R),SW -
      1) +  MID$(A$,A,1): GOTO 550
540  M$(R) =  LEFT$ (M$(R),C - 1) +  MID$ (A$,
      A,1) +  RIGHT$ (M$(R),SW - C)
550  M(R,C) = 1: ON X GOSUB 300,310,320,330,340
      ,350,360,370
560   NEXT A
570   RETURN
1000   HOME :D$ =  CHR$ (13) +  CHR$ (4): INPUT
      "MAXIMUM PRINTER WIDTH IS: ";PW
1010   INPUT "HOW MANY LETTERS WIDE SHOULD THE
       SEARCH BE? ";SW
1020   INPUT "HOW MANY LETTERS LONG SHOULD THE
       SEARCH BE? ";SL
1030  MS = SW: IF SL > MS THEN MS = SL
1040   IF SW > 9 AND SL > 9 AND SW <  = PW THEN
       1060
1050   PRINT "DIMENSIONS MUST BE AT LEAST 10 AND
       ": PRINT "WIDTH MUST BE LESS THAN ";PW +
       1: GOTO 1010
```

Program Listing continued

```
1060  DIM M(SL,SW): DIM M$(SL): DIM A$(MS * 2): DIM N$(SL)
1070  PRINT "WHAT PERCENT OF THE LETTERS OF THE": INPUT
      "SEARCH SHOULD BE WORDS? ";PC: IF PC > 25 THEN  PRINT
      "NO MORE THAN 25%": GOTO 1070
1080  PC = SW * SL * PC / 100
1090  Q = 1:TL = 0:WL = 0
1100  INPUT "ENTER WORD: ";A$(Q)
1110  IF  LEN (A$(Q)) > MS THEN  PRINT "WORD MUST HAVE "
      ;MS;" OR FEWER LETTERS.": GOTO 1100
1120  IF  LEN (A$(Q)) > WL THEN WL =  LEN (A$(Q))
1130  TL = TL +  LEN (A$(Q))
1140  IF PC > TL THEN Q = Q + 1: GOTO 1100
1150  PRINT "THAT'S ENOUGH WORDS.": PRINT "PLEASE WAIT W
      HILE I WORK."
1160  FOR B = 1 TO SL
1170  FOR C = 1 TO SW
1180  M(B,C) = 0
1190  M$(B) = M$(B) + "."
1200  NEXT C
1210  NEXT B
1220  FOR G = WL TO 1 STEP  - 1
1230  FOR B = 1 TO Q
1240  IF  LEN (A$(B)) <  > G THEN 1270
1250  A$ = A$(B)
1260  GOSUB 400
1270  NEXT B
1280  NEXT G
1290  FOR R = 1 TO SL
1300  N$(R) = M$(R)
1310  FOR C = 1 TO SW
1320  LT =  INT (26 *  RND (1)) + 65
1330  IF M(R,C) = 1 THEN 1370
1340  IF C < 2 THEN M$(R) =  CHR$ (LT) +  RIGHT$ (M$(R),
      SW - 1): GOTO 1370
1350  IF C = SW THEN M$(R) =  LEFT$ (M$(R),SW - 1) +  CHR$
      (LT): GOTO 1370
1360  M$(R) =  LEFT$ (M$(R),C - 1) +  CHR$ (LT) +  RIGHT$
      (M$(R),SW - C)
1370  NEXT C: NEXT R
1380  HOME : POKE  - 16368,0: PRINT "TURN ON PRINTER.": PRINT
      "PRESS ANY KEY WHEN READY.": GET C$
1390  PRINT D$;"PR#";PS
1400  HTAB (PW - 11) / 2 + 1: PRINT "WORD SEARCH": HTAB
      (PW - 11) / 2 + 1: PRINT "----- -------": PRINT : PRINT
1410  FOR A = 1 TO SL
1420  HTAB (PW - SW) / 2 + 1: PRINT M$(A)
1430  NEXT A
1440  PRINT : PRINT : PRINT : HTAB (PW - 5) / 2 + 1: PRINT
      "WORDS": HTAB (PW - 5) / 2 + 1: PRINT "------": PRINT
      :
5430  REM       TO BE WORDS
5440  REM   PS-SLOT NUMBER OF
5450  REM       PRINTER INTERFACE
5460  REM   PW-WIDTH OF PRINTER
5470  REM       LINE
5480  REM   Q-NUMBER OF WORDS IN
5490  REM     SEARCH
5500  REM   R-ROW NUMBER
5510  REM   RS-ROW NUMBER SAVER
5520  REM   SL-WORD SEARCH LENGTH
5530  REM   SW-WORD SEARCH WIDTH
5540  REM   TL-TOTAL NUMBER OF
5550  REM       LETTERS IN WORDS
5560  REM   WL-LENGTH OF LONGEST
5570  REM       WORD IN SEARCH
5580  REM   X-INDICATOR OF WHICH
5590  REM     DIRECTION WORD IS
5600  REM     BEING ENTERED INTO
5610  REM     ARRAY
5700  REM   **********************
5710  REM   * LINE DOCUMENTATION *
5720  REM   **********************
5730  REM   10-RESET SWITCHES TO
5740  REM       NORMAL
5750  REM   100-CHECK THAT INITIAL
5760  REM       ROW AND COLUMN
5770  REM       WON'T FORCE WORD
5780  REM       OFF ARRAY
5790  REM   300-UPDATE ROW AND
5800  REM       COLUMN FOR ENTRY
5810  REM       NEXT LETTER
5820  REM   400-DETERMINE STARTING
5830  REM       ROW AND COLUMN AND
5840  REM       DIRECTION OF WORD
5850  REM       WORD PLACEMENT
5860  REM   450-CHECK IF WORD
5870  REM       LOCATION CONFLICTS
5880  REM       WITH AN ALREADY
5890  REM       ENTERED WORD
5900  REM   510-PLACE WORD IN
5910  REM       SEARCH
5920  REM   1000-OBTAIN SEARCH AND
5930  REM       SYSTEM PARAMETERS
5940  REM   1090-ENTER WORDS AND
5950  REM       STOP WHEN ENOUGH
5960  REM   1160-INITIALIZE ARRAYS
5970  REM   1220-ENTER EACH WORD
5980  REM       IN ARRAYS
5990  REM   1290-FILL BLANKS WITH
6000  REM       RANDOM LETTERS
6010  REM   1380-PRINT SEARCH
6020  REM   1440-PRINT WORDS IN
6030  REM       SEARCH
6040  REM   1460-PRINT ANSWER
6050  REM   5000-STANDARD OPENING
6060  REM       CONVENTIONS OF
```

```
1450  FOR A = 1 TO Q: HTAB (PW - SW) / 2 + 1: PRINT A$(A
      ): NEXT A
1460  PRINT : PRINT : PRINT : FOR A = 1 TO PW: PRINT "*"
      ;: NEXT A
1470  PRINT : PRINT : HTAB (PW - 6) / 2 + 1: PRINT "ANSW
      ER": PRINT : FOR A = 1 TO PW: PRINT "*";: NEXT A: PRINT

1480  FOR A = 1 TO SL: HTAB (PW - SW) / 2 + 1: PRINT N$(
      A): NEXT A
1490  PRINT D$;"PR#0"
1500  END
5000  VTAB 4: HTAB 14: PRINT "WORD SEARCH"
5010  VTAB 6: HTAB 11: PRINT "COPYRIGHT (C) 1980"
5020  VTAB 8: HTAB 19: PRINT "BY"
5030  VTAB 10: HTAB 14: PRINT "MIKE FISCHER"
5040  VTAB 14: HTAB 10: PRINT "PRINTS A WORD SEARCH"
5050  VTAB 22: PRINT "SPACE TO CONTINUE...'ESC' TO END"
5060  VTAB 23: HTAB 20: GET A$
5070  IF A$ =  CHR$ (27) THEN  HOME : VTAB 20: HTAB 12: PRINT
      "*** THE END ***": END
5080  IF A$ =  CHR$ (32) THEN  RETURN
5090  GOTO 5060
5100  REM  ******************
5110  REM  * VARIABLES USED *
5120  REM  ******************
5130  REM
5140  REM  A-GENERAL COUNTER
5150  REM  A$-WORD BEING ENTERED
5160  REM      INTO SEARCH
5170  REM  A$(*)-WORD ARRAY
5180  REM  B-GENERAL COUNTER
5190  REM  C-COLUMN NUMBER
5200  REM  C$-CONTINUE STRING
5210  REM      CONTROLLER
5220  REM  CS-COLUMN NUMBER SAVER
5230  REM  D$-DISC CONTROL SYMBOL
5240  REM  G-GENERAL COUNTER
5250  REM  L-LENGTH OF WORD BEING
5260  REM    ENTERED INTO SEARCH
5270  REM  LT-RANDOM LETTER
5280  REM      SELECTOR
5290  REM  M$(*)-ARRAY HOLDING
5300  REM          ROWS OF WORD
5310  REM          SEARCH
5320  REM  M(*,*)-NUMBER ARRAY
5330  REM           SHOWING USED
5340  REM           SPACES IN WORD
5350  REM           SEARCH
5360  REM  MS-MAXIMUM SIZE OF
5370  REM      EITHER WORD SEARCH
5380  REM      DIMENSION
5390  REM  N$(*)-ARRAY HOLDING
5400  REM          ROWS OF WORD
5410  REM          SEARCH ANSWER
5420  REM  PC-PERCENT OF SEARCH
6070  REM        S.F. APPLE CORE
6080  REM  5100-DOCUMENTATION OF
6090  REM        VARIABLES
6100  REM  5700-DOCUMENTATION OF
6110  REM        LINES
6900  REM  ******* NOTE *******
6910  REM  ** ALL LINES FROM **
6920  REM  ** 5100-6970 ARE  **
6930  REM  ** DOCUMENTATION  **
6940  REM  ** AND CAN BE     **
6950  REM  ** DELETED IF     **
6960  REM  ** DESIRED.       **
6970  REM
7000  REM   ******************
7010  REM                     *
7020  REM   WORD SEARCH       *
7030  REM                     *
7040  REM   COPYRIGHT 1980    *
7050  REM                     *
7060  REM   BY MIKE FISCHER   *
7070  REM                     *
7080  REM   MARCH 3, 1980     *
7090  REM                     *
7100  REM   (415) 933-4435    *
7110  REM                     *
7120  REM   ******************
```



Pricing Your Product

for a Two-Step Distribution Channel

BY IRA S. GERSON

Most manufactured goods as well as many agricultural products are sold through a two-step channel, often referred to as the orthodox or customary channel for moving consumer goods. This program lets you develop a pricing structure based on quantity price breaks and account for the various gross margins required by the retailer, wholesaler and manufacturer.

Manufacturers of consumer goods will find this program useful in formulating their quantity pricing structure. With a printer, manufacturers can use it to generate the final price sheet.

This program is not directly applicable to retailers or manufacturers who are in a one-step distribution channel. (See my article "Generating A Price List," for a one-step channel in the February 1980 issue of *Personal Computing*.) However, these manufacturers can use it to analyze the costs and margins associated with the two-step distribution form. Therefore, the wholesaler as middleman and the manufacturer requiring two middlemen will benefit most directly from this program.

The equipment used included a TRS-80 with 4K RAM and Level I Basic Language. The program should be easily adapted to other machines.

This program reduces the time required to generate price sheet structure for any number of products and price breaks due to multiple quantity discounts. With some modifications, the program could be used to generate the actual price sheets.

The program could also analyze various price structures given this type of distribution channel, to determine the feasibility of entering an existing market with a new or modified product. The program can aid in the review of price reductions/increases if the market price (List Price) does not allow desired margins because of decreasing/increasing costs in the distribution channel or at the point of manufacture. Here's an example of analyzing price structures from a manufacturing point of view:

Given: (A) Must achieve corporate goal of 40% GM for an annual production run of 5000 units that have a standard cost of $249.00/Unit. (B) Market research and analysis indicates that $1000/Unit is the target price for the end user.

Solve: Determine the pricing structure to yield the above goals.

Assumptions: (A) You have 10 distributors to whom the following allocation has been estimated.

1st Distributor (Wholesaler)	2500 Units/yr.
2nd Distributor	1500 Units/yr.
3rd Distributor	500 Units/yr.
4th thru 10th Distributor (10 to 100 units each)	500 Units/yr.
	5000

Mr. Gerson has formed a consulting/software firm as a result of his research work in microcomputer business applications.

(B) The distributor buying the largest volume is given 35% off dealer net.

(C) The larger dealers are looking for 40% off list.

Based on the above data you might input the following figures into the program.

1. Maximum % Off List	40
2. Dealer Discount/Break	3
3. Maximum % Off Dealer Net	35
4. Wholesaler Discount/Break	3
5. Minimum Mfg. GM (%)	40
6. Number of Price Breaks	4

From the display the following calculations can be made.

Sales

2500 × $415 =	$1,037,500
1500 × $456 =	$ 684,000
500 × $499 =	$ 249,500
500 × $543 =	$ 271,500
5000	$2,242,500

Cost

$249 × 5000 = $1,245,000

GM = $997,500 = 44%

Therefore, you can adopt this structure or refine it further by reducing the minimum MFG GM to 36% or increasing the number of price breaks or selectively altering any of the breaks to yield an overall GM level of 40%.

The program consists of two main sections and includes a menu for added flexibility. The opening (lines 10 to 20) creates the mechanics for the menu.

The first section (lines 22 to 96) develops the "marketing approach" which requires the user to input the list price and the various margins required by the channel participants.

Lines 70 to 84 in the first section contain the three basic formulas necessary to derive the Dealer's Net (D), the Wholesaler's Net (W), and the Manufacturer's Cost (C).

The first formula to determine the dealer's net is:

$$D = P(1 - A/100)$$

where P is the List Price and A = % Off List for the Dealer. In the example given:

$$D = \$49.95\ (1 - .30) = \$34.96$$

The second formula to determine the wholesaler's net is:

$$W = D(1 - B/100)$$

where D is taken from the previous calculation and B = % Off List for the Wholesaler. In the example given:

$$W = \$34.96\ (1 - .18) = \$28.67$$

The third formula to determine the cost is:

$$C = P(1 - X/100)(1 - Y/100)(1 - H/100)$$

where P is the List Price, X and Y are the maximum % off list for the Dealer and Wholesaler, and H is the minimum gross margin selected for the manufacturer. In the example given:

$$C = \$49.95\ (1 - .45)(1 - .38)(1 - .30) = \$11.92$$

The second section (lines 98 to 174) develops the "manu-

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CIRCLE 18

facturing approach" which requires the user to input the manufacturing cost instead of the list price as above.

Lines 146 to 154 in the second section contain similar equations to the three above but have been modified so that cost can be the given parameter as opposed to the given parameter of list price used in the marketing approach.

The formula to determine the Dealer's Net is:

$D = (C (1 - A/100))/((1 - X/100) (1 - Y/100) (1 - H/100))$

where C is the cost, X and Y are the maximum % off list for the Dealer and Wholesaler, and H is the minimum gross margin selected for the Manufacturer. In the example given:

$D = \$11.92 \times (1 - .30)/(1 - .45) (1 - .38) (1 - .30) = \$34.96$

The formula to determine the Wholesaler Net, $W = D \times (1 - B/100)$, is the same as that used in the marketing approach.

The formula to determine the List Price is:

$P = C/((1 - X/100) (1 - Y/100) (1 - H/100))$

where C is the given cost and X, Y and H are described above. In the example given:

$P = \$11.92/(1 - .45) (1 - .38) (1 - .30) = \$49.94$

There are several other items that are associated with a pricing schedule but have not been included here for the sake of simplicity. They are cumulative quantity discounts, co-operative advertising allowances and cash discounts.

This program can assist in the analysis of the following programs:

1. New Product Introductions
2. Channel Impact As a Result of Price or Cost Reductions/Increases
3. Gross Margin Analysis
4. Product Volume Mix

□

Given: You are a manufacturer or wholesaler who wishes to supply a product which could command a list price of $49.95 per unit in the market place. There are six price breaks (i.e. 1-12 units, 13-36 units, 37-72 units, 73-144 units, 145-180 units, & over 180 units) and you input the distribution discounts as follows:

Maximum (%) off list	**45**
Dealer discount per break (%)	**3**
Maximum (%) off wholesale net	**38**
Wholesaler discount per break (%)	**4**
Minimum manufacturing GM (%)	**30**
Number of quantity price breaks	**6**

Sample Run

The following should appear on the CRT:

MODEL DESP	LIST PRICE $	ORDER QUANT UNITS	DLR NET $	% OFF LIST	ORDER QUANT UNITS	WHOLSLE NET $	% OFF LIST	MFG COST $	% GM
*	49.95	*	34.96	30	*	28.67	18	11.92	58
	49.95		33.47	33		26.11	22	11.92	54
	49.95		31.97	36		23.66	26	11.92	50
	49.95		30.47	39		21.33	30	11.92	44
	49.95		28.97	42		19.12	34	11.92	38
	49.95		27.47	45		17.03	38	11.92	30

TYPE ANY LETTER TO SEE MENU?

If "Manufacturing Approach" is chosen with a cost input of $11.92, a price of $49.94 will be generated assuming all the other inputs are the same.

* These columns have been left blank so the user can fill in the appropriate information per his requirements.

Program Listing

```
 2  REM* THIS PROGRAM CALCULATES DEALER NET, DEALER GM (% OFF LIST), WHOLESALE
NET, WHOLESALE GM (% OFF LIST), MANUFACTURING COST AS A FUNCTION OF
DISTRIBUTION CHANNEL COSTS, GIVEN THE DESIRED FACTORY GROSS MARGIN FOR A
2 STEP DISTRIBUTION CHANNEL*

 5  CLS
10  PRINT "ENTER REQUEST"
12  PRINT "---1. MARKETING APPROACH"
14  PRINT "---2. MANUFACTURING COST APPROACH"
16  PRINT "---3. END OF RUN"
18  PRINT: INPUT "SELECTION"; R
19  CLS
20  ON R GOTO 22, 98, 174
22  PRINT "MARKETING APPROACH"
24  INPUT "LIST PRICE"; P
26  INPUT "MAXIMUM (%) OFF LIST"; X
28  INPUT "DEALER DISCOUNT PER BREAK (%)"; M
30  INPUT "MAXIMUM (%) OFF WHOLESALE NET"; Y
32  INPUT "WHOLESALER DISCOUNT PER BREAK (%)"; T
34  INPUT "MINIMUM MANUFACTURING GM (%)"; H
36  INPUT "NUMBER OF QUANTITY PRICE BREAKS"; Q
37  CLS: FOR N=1TO63: PRINTTAB(N);"-";: NEXT N
44  PRINT "MODEL"; TAB(7);"LIST";TAB(14);"ORDER";TAB(21);"DLR";TAB(27);"%";
46  PRINTTAB(31);"ORDER";TAB(38);"WHOLSLE ";TAB(48);"%";TAB(53);"MFG"
48  PRINT "DESP";TAB(7);"PRICE";TAB(14);"QUANT";TAB(21);"NET";
50  PRINTTAB(26);"OFF";TAB(31);"QUANT";TAB(40);"NET";TAB(47);"OFF";
52  PRINTTAB(52);"COST";TAB(58);"%GM"
54  PRINTTAB(8);"$";TAB(14);"UNITS";TAB(21);"$";TAB(25);"LIST";
56  PRINTTAB(31);"UNITS";TAB(40);"$";TAB(47);"LIST";TAB(54);"$"
58  FOR N=1TO63: PRINTTAB(N);"-";: NEXT N
64  A=X-(M*(Q-1)): B=Y-(T*(Q-1))
66  IF A>X THEN 95
68  IF B>Y THEN 95
70  D=P*(1-A/100)
72  D=D+.005: D=INT(D*100)/100
74  W=D*(1-B/100)
76  W=W+.005: W=INT(W*100)/100
78  C=P*(1-X/100) * (1-Y/100) * (1-H/100)
80  C=C+.005: C=INT(C*100)/100
82  G=(W-C)/W*100
84  G=G+.5: G=INT(G)
86  PRINTTAB(7);P;TAB(20);D;TAB(26);A;TAB(37);W;TAB(46);B;
88  PRINTTAB(51);C;TAB(56);G
90  A=A+M: B=B+T
94  GOTO 66
95  INPUT "TYPE ANY LETTER TO SEE MENU"; A$: CLS
96  GOTO 10
98  PRINT "MANUFACTURING APPROACH"
100  INPUT "COST"; C
102  INPUT "MAXIMUM (%) OFF LIST"; X
104  INPUT "DEALER DISCOUNT PER BREAK (%)"; M
106  INPUT "MAXIMUM (%) OFF WHOLESALE NET"; Y
108  INPUT "WHOLESALER DISCOUNT PER BREAK (%)"; T
110  INPUT "MINIMUM MANUFACTURING GM (%)"; H
112  INPUT "NUMBER OF QUANTITY PRICE BREAKS"; Q
113  CLS
114  FOR N=1TO63: PRINTTAB(N);"-";: NEXT N
120  PRINT"MODEL";TAB(7);"LIST":TAB(14);"ORDER";TAB(21);"DLR";TAB(27);"%";
122  PRINTTAB(31);"ORDER";TAB(38);"WHOLSLE";TAB(48);"%";TAB(53);"MFG"
124  PRINT"DESP";TAB(7);"PRICE";TAB(14);"QUANT";TAB(21);"NET";
126  PRINTTAB(26);"OFF";TAB(31);"QUANT";TAB(40);"NET";TAB(47);"OFF";
128  PRINTTAB(52);"COST";TAB(58);"%GM"
130  PRINTTAB(8);"$";TAB(14);"UNITS";TAB(21);"$";TAB(25);"LIST";
132  PRINTTAB(31);"UNITS";TAB(40);"$";TAB(47);"LIST";TAB(54);"$"
134  FOR N=1TO63: PRINTTAB(N);"-";: NEXT N
140  A=X-(M*(Q-1)): B=Y-(T*(Q-1))
142  IF A>X THEN 171
144  IF B>Y THEN 171
146  D=(C*(1-A/100))/((1-X/100) * (1-Y/100) * (1-H/100))
148  D=D+.005: D=INT(D*100)/100
150  W=D*(1-B/100)
152  W=W+.005: W=INT(W*100)/100
154  P=C/((1-X/100) * (1-Y/100) * (1-H/100))
156  P=P+.005: P=INT(P*100)/100
158  G=(W-C)/W*100
160  G=G+.5: G=INT(G)
162  PRINTTAB(5);P;TAB(17);D;TAB(25);A;TAB(37);W;TAB(46);B;
164  PRINTTAB(51);C;TAB(56);G
166  A=A+M:  B=B+T
170  GOTO 142
171  INPUT "TYPE ANY LETTER TO SEE MENU"; A$: CLS
172  GOTO 10
174  END
```

Using Moving Averages to Track Stock Prices

BY E.D. SHAFER

Anyone looking at the chart of the Dow Jones Industrial Average in the *Wall Street Journal* each weekday can spot low points recurring at relatively uniform time periods. (See, for example, Chart 1.) These lows correspond to the daily cycles to which the Dow responds. Looking further at a chart with weekly prices (Chart 2), you can see other lows, only this time they occur weeks instead of days apart. If you know the frequencies of the most dominant of these cycles and are able to identify when they last occurred, you can determine when the cycles should repeat.

Some of the more prominent cycles you can use for trading in the stock market are: 54 month, 18 month, 6 month, 3 month and 7 week. The 54 month cycle has been evident for several decades. It was especially obvious in 1962, 1966, 1970 and 1974. It was not so obvious in 1978 but a low did occur in March 1978 which has not been exceeded. This cycle conforms with the well known bull-bear cycle that market buffs speak of so much.

Moving Averages and What They Do

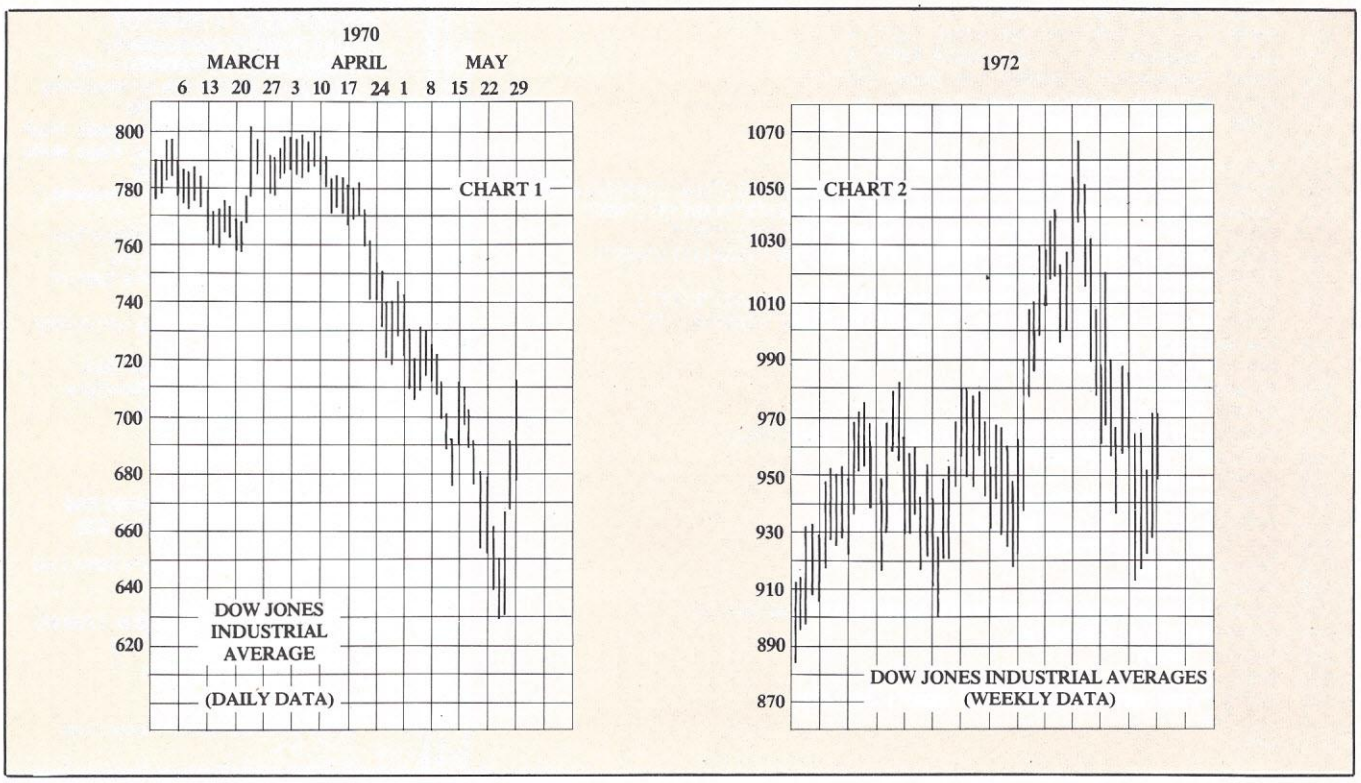
A moving average is a statistical tool for smoothing data. It is calculated by summing a number of items in a series and dividing by the number of items summed. For example, if you wanted to calculate a moving average of seven items in a series of 10 items, you would add the first seven items and divide by seven to get the first average. You would then drop the first item in the series and add the eighth to the previous total and again divide by seven. This would give the second average. For the third average you would drop the second item and add the ninth. Thus, you'd be moving the average along the number series until you ran out of data.

If a moving average is calculated with a span that equals one of the market cycles such as the three month cycle (13 weeks), the average will reduce to zero any fluctuation in price due to the 13 week cycle and will at the same time suppress all smaller cycle influences significantly. What would be revealed is the effect of the sum of all larger cycles present in the market prices. A moving average with a span of 13, when plotted on a price chart of the Dow Jones Industrial Average, will reveal the influence of the six month plus 18 month plus 54 month plus any other cycles between or greater than these.

Another valuable feature of a moving average is that it cuts right through the middle of the price action of the next larger cycle than the one for which it is calculated. Thus, a 13 week moving average will cut through the prices affected by the 26 week (six month) cycle when it is plotted properly.

Keep in mind that each average that you calculate is a number that represents the central point of a time series. If you calculate a moving average with a span of 13 weeks, each calculation represents a typical price for the 13 week period and should be plotted at the middle of that time period (seven weeks back). When plotted in this manner the line that is formed will be found to bisect the data.

Mr. Shafer is a research analyst with the state of California. He authors a weekly newspaper column, "Winning on Wall Street," in which he discusses methods of successfully investing in the stock market and using cycle analysis to improve timing.



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CIRCLE 21

Using the TRS-80

Before I bought my TRS-80 Level II, 16K computer I had to calculate moving averages using a hand-held calculator. If I were to be concerned with just one cycle and only with the recent past the old hand-held "four-banger" would do just fine. However, I am a market advisor and researcher and need the capability to look at stocks, commodities, options and indices both currently and historically.

My problem at the time I purchased the TRS-80 was that I didn't know how to program a computer and no tailor-made programs existed. So, I had to learn to program in Basic and then to debug my programs. This took some time but eventually I worked out a satisfactory program to calculate four basic moving averages — seven week, 13 week, 21 week and 39 week — which would reveal the most important market cycles and display them on the screen or print them out on my Radio Shack Quickprinter a year at a time.

Simplified Moving Average Calculations

In recent years, a process called "exponential smoothing" has become popular as a substitute for the traditional method of calculating moving averages. While the method I described previously is simple, it requires the use of several memory cells to keep track of all the data being calculated. Exponential smoothing requires holding only the smoothing factor, the previously calculated average and the latest data item.

Here's the algorithm for exponential moving averages:

Smoothing Factor = $2/(p + 1)$

p = the span of the moving average

New Average = Previous Average + (Smoothing Factor × (Latest Data − Previous Average))

The smoothing factor is determined by the span of the moving average you are interested in. For example, if you want to calculate a 39 week moving average to see the effect of the 18 month and 54 month cycles on market prices, the smoothing factor would be .05 $(2/(39+1) = 2/40 = 1/20 = .05)$.

To start the process you would use the first data item as the previous average and calculate the second average (the second data item minus the first data item) as multiplied by the smoothing factor. The product would then be added to the first data item.

Using 800 as the first item, 820 as the second, 830 as the third item, and .05 as the smoothing factor the results would be:

ITEM #	VALUE	MA39	EXPLANATION
1	800	800	
2	820	801	800 + .05 (820 − 800) = 800 + .05 (20) =800 + 1 = 801
3	830	802*	801 + .05 (830 - 801)= 801 + 1.45 = 802.45

** Rounded to the nearest integer*

Moving Average Program

Line 5 clears 100 memory cells to allow the use of STRING$ in line 150, which calls for 63 dashes. The computer clears only 50 cells on start-up. Also on this line variables E, I, L, N, P, X and Y have been defined as integers.

Line 10 arrays A( ), B ( ), C( ), D( ), V( ) have been dimensioned to 53 to account for the years which contain 53 weeks of data. Line 20 allows for averages to be calculated for less than a year. Line 30 is an error trap.

Line 60 initializes the first "averages" equal to the first value. This is necessary for the first treatment of the data but

Program Listing

```
1 'EXPONENTIAL MOVING AVG. PROGRAM
2 'BY E. D. SHAFER, RANCHO CORDOVA CA.
3 ' MARCH 1, 1980
5 CLEAR100:DEFINT E,I,L,N,P,X,Y:L=53
10 DIM A(L),B(L),C(L),D(L),V(L)
20 INPUT"HOW MANY ENTRIES(3-53)";E
30 IF E<3 OR E>53 THEN 20
40 INPUT"ENTER YEAR";Y
50 INPUT"ENTER FIRST VALUE";V(1):CLS
60 A(1)=V(1):B(1)=V(1):
   C(1)=V(1):D(1)=V(1)
62 INPUT"IS THIS RUN ONGOING(Y/N)";B$
64 IF LEFT$(B$,1)="Y" GOSUB 500
70 FOR N=2 TO E:P=(N-1)
80 INPUT"ENTER NEXT VALUE";V(N):CLS
90 A(N)=INT(A(P)+.25*(V(N)-A(P))+.5)
100 B(N)=INT(B(P)+.14*(V(N)-B(P))+.5)
110 C(N)=INT(C(P)+.09*(V(N)-C(P))+.5)
120 D(N)=INT(D(P)+.05*(V(N)-D(P))+.5)
130 NEXT:PRINT TAB(30)Y
140 PRINT TAB(0)"WEEK";TAB(13)"VALUE";
    TAB(26)"MA-7";TAB(38)"MA13";
    TAB(49)"MA21";TAB(59)"MA39"
150 PRINT STRING$(63,"-"):X=1
160 FOR I=X TO X+11
170 PRINT TAB(1)I;TAB(13)V(I);
    TAB(26)A(I);TAB(38)B(I);
    TAB(49)C(I);TAB(59)D(I);
180 IF I=E THEN 210
185 NEXT
190 INPUT"PRESS ENTER TO CONTINUE";Z
200 X=X+12:CLS:GOTO 160
210 PRINT:INPUT"PRINT RESULTS(Y/N)";A$
220 IF LEFT$(A$,1)="Y" THEN 240
230 END
240 LPRINT CHR$(31):LPRINT TAB(6)Y
250 LPRINT CHR$(30):LPRINT CHR$(15)
260 LPRINT TAB(0)"WEEK";TAB(6)"VALUE";
    TAB(13)"MA-7";TAB(19)"MA13";
    TAB(25)"MA21";TAB(31)"MA39"
270 LPRINT CHR$(14)
280 FOR I=1 TO E
290 LPRINT TAB(1)I;TAB(7)V(I);
    TAB(13)A(I);TAB(19)B(I);
    TAB(25)C(I);TAB(31)D(I)
300 NEXT:END
500 PRINT"TO CONTINUE WITH A NEW YEAR"
510 PRINT"ENTER THE LAST AVERAGES FOR MA-7"
520 PRINT"MA13, MA21, AND MA39"
530 PRINT"FROM PREVIOUS YEAR"
540 INPUT"ENTER LAST MA-7";A(0):CLS
550 INPUT"ENTER LAST MA13";B(0):CLS
560 INPUT"ENTER LAST MA21";C(0):CLS
570 INPUT"ENTER LAST MA39";D(0):CLS
580 A(1)=INT(A(0)+.25*(V(1)-A(0))+.5)
590 B(1)=INT(B(0)+.14*(V(1)-B(0))+.5)
600 C(1)=INT(C(0)+.09*(V(1)-C(0))+.5)
610 D(1)=INT(D(0)+.05*(V(1)-D(0))+.5)
620 RETURN
```

will not be used for ongoing calculations beyond the first year. It will take as many calculations as the span of the moving average before the "correct" average will be derived. For example, a span of 39 will require 39 calculations before the proper moving average will result. When you rerun the program for a subsequent year you don't want to throw away data in this fashion so I have inserted lines 62 and 64 to avoid this problem. Lines 62 and 64 set up a subroutine to allow the last averages from the previous run to be input.

Lines 70 through 130 provide a loop for inputting the data and calculating the four moving averages as the data are input. Lines 130 through 150 set up table headings. Lines 160 through 185 provide a loop to print to the screen 12 lines of data.

Line 190 stops the screen scroll until data have been transcribed. Pressing "Enter" sets up the process again for the next 12 lines of data, and so forth, at line 200.

Line 180 escapes the loop when all the data have been calculated and calls for a decision to print results or to end the program. At this point the remainder of the program can be eliminated if you don't have a printer. For those with a line printer, modifications may be needed in the program to account for different types of commands. I have a Radio Shack Quickprinter and the program is coded to use that printer's requirements.

Line 240 sets the size of type to 20 characters per line (CHR$ (31)) and prints the year in that size. Line 250 resets the type size to 40 characters per line (CHR$ (30)) and sets up an underline feature (CHR$ (15)).

Line 260 prints the headings for the table and underlines them. Line 270 turns off the underline feature (CHR$ (14)). Lines 280 through 300 print out all the data using a FOR/NEXT loop. Lines 500 through 620 contain the subroutine for continuing calculations beyond the first year.

Be sure, when plotting these moving averages, to move each average back one half span on the charts. The seven week average should be plotted at the fourth week back; the 13 week average, seven weeks back; the 21 week average, 11 weeks back; and the 39 week average, 20 weeks back. When this is done you'll notice that the average bisects the prices according to the cycles it is revealing.

I suggest you plot only one average span per chart and then create an upper and lower channel boundary to the price display by plotting lines vertically equidistant from the average which encompass the highs and lows. You will thus have a channel within which the prices have historically fluctuated and within which they should continue to move in the near future.

Anyone who would like to discuss either the program or the moving average analytical techniques in further detail can write to me c/o *Personal Computing*, 1050 Commonwealth Ave., Boston, MA 02215. □

Sample Run

1980

WEEK	VALUE	MA-7	MA13	MA21	MA39
1	826	832	834	838	841
2	847	836	836	839	841
3	868	844	840	842	842
4	875	852	845	845	844
5	881	859	850	848	846
6	884	865	855	851	848
7	897	873	861	855	850
8	874	873	863	857	851
9	861	870	863	857	852

How to write for Personal Computing

You've written the programs we want to publish. You – the *Personal Computing* readers – are using your computers in businesses, homes, offices and schools. Other readers, just as software-hungry as you, are eager to try out your programs, your applications and your techniques. So why not share what you've done by submitting an article to *PC?*

It's easier than you might think. Remember: we're more interested in practical programs and useful applications than in fancy prose. And our editorial staff stands ready to help with any problems you encounter in writing your article; just give us a call at (617) 232-5470.

Here are some handy guidelines to help you get started.

First, decide what kind of article you want to write. Do you have a *business program* that will help an executive, salesman, doctor, lawyer or shopkeeper function more efficiently? Think about how businesses can benefit from microcomputers – not only in the obvious areas of inventory, accounting and payroll, but in all departments and levels right up to the president's desk. Financial and marketing analysis, time management, planning, material handling, product design and cost accounting are areas ripe for creative programming.

How do you use your computer for *home and personal applications* in your living room, kitchen, study or den? Again, think beyond the obvious areas of checkbook balancing and budgeting (though these areas are far from exhausted) to other applications. Hobbies, home management, household inventory, gardening and landscaping, personal income and expense analysis, personal mailing lists and word processing are just a few ideas to spark your imagination.

What *education programs* have you written for children, adults, professionals, businessmen and teachers? Computers can not only teach children basic subjects such as spelling, math, geography, economics, civics, grammar, literature and science, but can help adults review or sharpen skills in these areas as well. How else can computers function in or out of the classroom to aid learning? To help teachers and administrators?

Are you proficient in some programming technique or special computer area you could explain in a *tutorial article*? How do you save time, money, computer memory or frustration when programming or using your computer? Others can benefit from the same techniques you use.

Computer games, history, humor and *fiction* are other areas rich in article and story ideas.

Your second step is to write the text of the article. Remember, readers aren't familiar with your program. So explain in detail what the program does and how it does it. Include here the overall structure of your program as well as any special algorithms or routines you've used. Give suggestions for modifying or expanding the program for other applications, other businesses or other situations.

Third, prepare your supporting documentation. Include at least a program listing and one or two sample runs, and add program notes to explain any special commands used or other special features of your program. Use charts, diagrams, figures and photos if they help explain your program and its use.

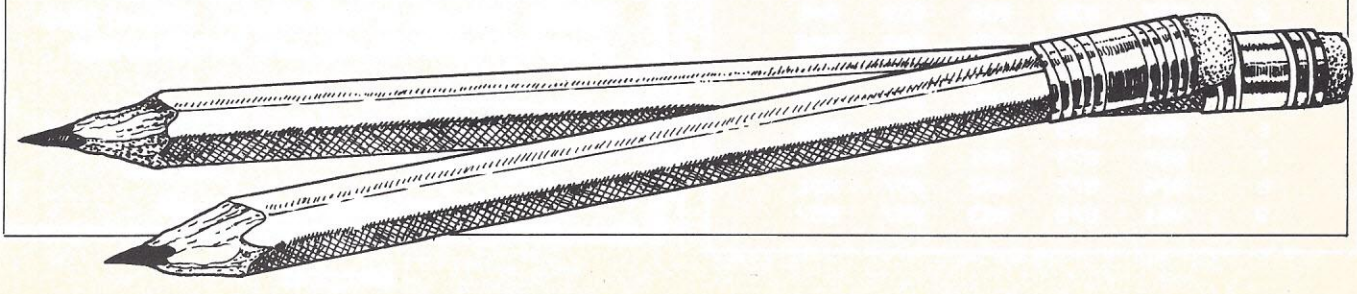
Finally, mail your manuscript. Address it to: Don Wood, Managing Editor, Personal Computing Magazine, 1050 Commonwealth Ave., Boston, MA 02215.

A few suggestions: All submissions should be original, typed (*not* all CAPS), double-spaced and neat. Please include your name and address on the first page of the article and enclose a self-addressed, stamped envelope for return of material.

Since we photograph program listings and sample runs exactly as you send them to us for publication in the magazine, please be sure you use a fresh ribbon for computer printouts. If you don't have a printer, you can type your listings single spaced; but again, be sure you use a new ribbon. (If your program relies heavily on graphics, you can photograph sample runs from your CRT. But take care to avoid distortion due to the curve of the screen.)

Feel free to call us if you have any questions or want to discuss specific ideas. We can give you feedback and suggest appropriate slants and approaches.

We're always looking for fresh, original ideas. While these guidelines will help you in preparing material for *Personal Computing*, don't assume we don't want your idea just because it's not mentioned here. Let us and our readers know what *you're* doing with your computer.



Problem Solving and Computers

BY DAVID LUBAR

Problem solving and computers? While this seems like a connection that is too obvious to mention, there are times when users overlook the problem-solving potential of their micros. Consider the following situation: In the middle of writing a program, you encounter a snag which sends you to the manuals in search of information. The answer might not be there, or it might be so well buried in a footnote that your quest begins to resemble a snark humt. There is an easier approach. Let the computer provide the solution.

This article covers two topics; getting the computer to solve problems about itself, and solving the problem of how to get the computer to solve problems about itself. (If you made it through that, the rest is easy.)

First, a simple example using a FOR/NEXT loop.

```
100 FOR I=1 TO 10
110 IF MID$(X$,I,1)="P" THEN 140
130 NEXT I
140 SCORE=I*5
```

Here, if P is found, the value of I at that point is used to assign a value to the variable SCORE. But what if P isn't found? Will the value of I be 10 or 11? (You might already know the answer to this; I said it was simple.)

Rather than search the manuals, you can get the answer with a short program. What would the program be like? First, it would contain a loop, since that is the function being investigated. And there would be a line which prints the value of the loop variable after the loop is finished. This would do the job:

```
10 FOR I=1 TO 10
20 NEXT I
30 PRINT I
```

After one RUN, you have the answer. To develop an overall approach to problem solving, we'll look at a number of questions and their solutions. The problems can be divided into two types:

1. What will the computer do with this data?
2. What will happen when the computer performs these commands?

In most cases, the approach will be to set up the situation under question along with lines to print the required information.

Problem: To change the sign of a variable, do you have to multiply the variable by −1?

You know that X=−1*X will change the sign of X. Will X=−X do the same job? A short program sets up the situation and prints the result.

```
10 X=5
20 X=-X
30 PRINT X
```

This program will provide the answer. What if X starts out with a negative value? If you don't know the answer, use the above approach to find out.

When more than one variable is involved, the process is basically the same. The only difference is that more output is needed. In such cases, the output should be organized in an understandable manner. The following example demonstrates this point.

Problem: How accurate is your computer?

You probably know a bunch of specifics such as the length of floating point numbers in your system. But, in a practical application, what sort of accuracy can you expect? A quick way to test pocket calculators is to take the square root of a number, and then square the result. Will the value lost going one way be regained going the other way? And will the magnitude of the number make any difference?

The squared square-root test can be applied to a computer. Again, the first step is to set up the function you want to investigate. Since many values will be checked, a loop would come in handy. Setting up the function in a loop, we get:

```
10 FOR I=2 to 1000: REM THE END VALUE DEPENDS
   ON YOUR PATIENCE AND CURIOSITY.
20 X=(SQR(I)^2
```

Now, the data has to be produced in a meaningful way. We want to see each number, and see the result of squaring its square root. Columns can usually be used to give a readable output. 30 PRINT I,X

So the numbers won't fly by, add a delay loop. And, to further increase readability, you can add a blank line between printouts.

```
40 FOR J=1 TO 200: NEXT J: PRINT
50 NEXT I
```

Using this program, you can find out how your machine treats this calculation, and see whether large numbers are handled in a different manner.

The above program can be refined slightly. Since numbers which are perfect squares will obviously return integers in the above function, the data could be confusing. To remove such numbers, add the line:

```
15 IF SQR(I)=INT(SQR(I)) THEN 50
```

If your test program deals with several variables, you might want to add lines such as: 100 PRINT "X=";X or 100 PRINT "THE VALUE OF THE INITIAL VARIABLE IS ";X.

One more idea: If the test program uses a number of variables, and each variable will be tested for several values, time can be saved by using "constants." The pseudo-constants will be used to give values to the test variables. For example:

```
10 A=5: B=7
20 X=(A*B)/A + (A*B)/B
```

To test different values, just change the first line. To stray from the topic for a moment, it should be mentioned that this technique is a great time saver when you are developing a program. Say, for example, you are trying to format printout. Rather than having a number of lines with the statement TAB (7), and changing all these lines whenever you want to try a

different setting, just use TAB (T). In this way, different TAB settings can be investigated merely by changing the value of T. (Note to Apple users: In a large lores graphics program, use COLOR=A, COLOR=B, and so on. This simplifies the process of finding the right color combination.)

Let's look at some problems that don't involve data. What happens if a program ends in a subroutine? For example:

```
10 GOSUB 100
100 REM REST OF PROGRAM IS HERE
```

Call the first subroutine A. Now, A can also contain GOSUBs, which, on RETURN, will give control back to A. But if the number of GOSUBs in A equals the number of RETURNs, the program will end without going back to the original GOSUB. If such a program is RUN more than once, will the lack of that final RETURN cause the program counter to overflow, or cause some sort of error message?

The best way to find out is with a short program.

```
10 GOSUB 20
20 PRINT "A": REM USE A PRINTOUT TO
SEE WHEN THE PROGRAM REACHES THIS POINT
```

RUN this a number of times. Or, if your Basic allows, add 30 RUN. Then sit back for a while and see if an error occurs.

What will your machine do if it expects a numerical input but gets a letter, or vice versa? What happens if a loop variable is given a new value inside the loop? Don't go to the manual. Find out from the computer.

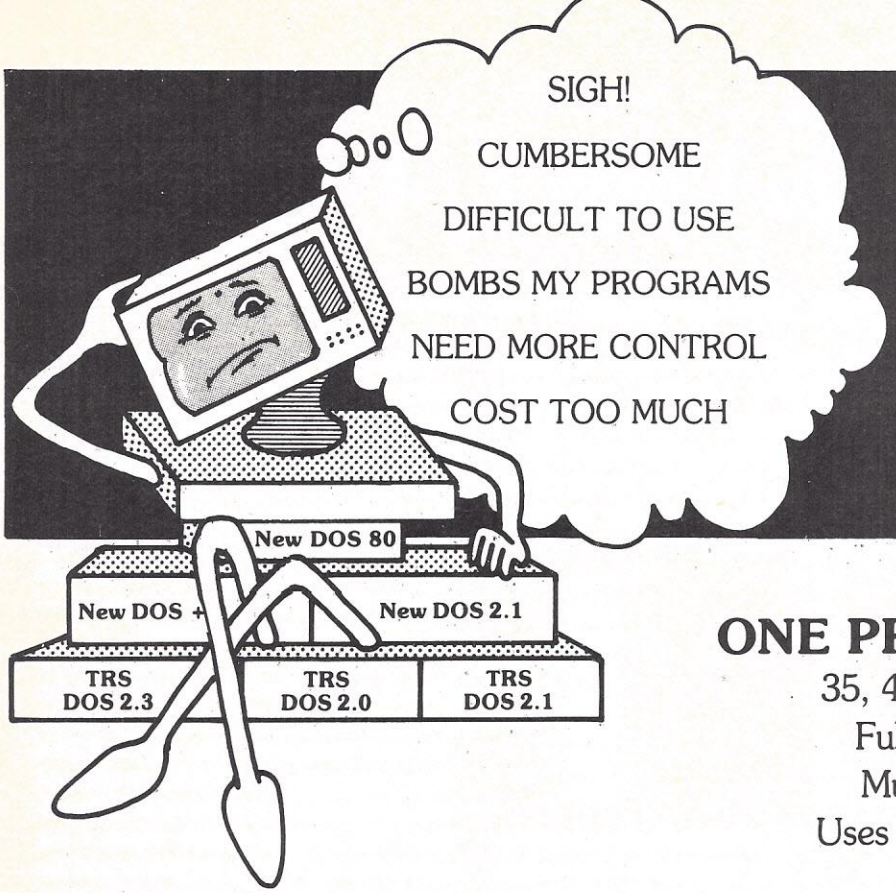
Problem: When is a line really lost?

If you type 100, followed by a return, any former line 100 will no longer LIST. But has the line been removed from memory? In this case, a simple program won't provide the answer. But a simple technique will.

Start with nothing in memory (turn the power off for a few seconds). Enter a line with a single statement, such as: 10 PRINT "TEST".

After this, enter the monitor. (If your machine doesn't allow access to the monitor, use a loop that PRINTs a series of PEEKs.) Somewhere right below HIMEM will be a series of numbers representing the line of Basic (it should stand out since it will be surrounded by nothing but 00s or FFs.) Write this series down. Now, go back to Basic and erase the line by typing its number followed by a return. Check the monitor again. Are the original numbers still there? If not, the line is really gone. If the numbers are still there, or are there with some small changes, then the line isn't lost. Some actions will definitely erase lines (turning off the power is one example), other actions just change the pointers to a line or alter some of the data in the line. Try the above technique with NEW, DEL, and any other commands you can think of. Then see if the line is really lost.

Since there are a large number of ways in which commands and data can be combined, and a limit to the amount of documentation that a vendor can provide, questions are bound to arise for which the answers aren't readily available. But, by setting up the right kind of program, you can find the answers. The solution might provide you with a new shortcut or trick to add to your Basic repertoire. Don't let your computer lie idle while you search through manuals. □



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CIRCLE 23

Cash in on the Power of Pascal

BY SAM GAYLORD

Are there a few "old" (1964 and earlier) U.S. silver coins stashed somewhere around your house? Maybe in a Mason jar or piggy bank? If so, you are likelier a little richer than you suppose. Recent spot market prices for silver have topped out above what gold was selling for just a few years ago. As a result, many U.S. coins, when sold for their meltable silver content, yield surprisingly high returns compared to their nominal face value. Even a 1963 dime will bring you up to $1.43 in melt value when silver is $20 an ounce. And silver recently has been up around the $40 mark!

Silvercoin, a program in the elegantly structured UCSD Pascal language, nicely demonstrates Pascal's computing power and syntax and, in addition, can help you mine the gold in them thar silver coins!

This program deals with the "melt value" of the coins entered as data. It does not deal with the numismatic value of interest to coin collectors. (You will find an excellent program on "Coin Collecting" by Charles D. Sternberg in the October 1979 issue of *Personal Computing*.) Silvercoin is based on the official weights of silver content published in the 1980 guide of the American Numismatic Association.

To run the program, first gather your coins in a stack — only those coins of 1964 and earlier vintage (of *any* denomination), half-dollars minted between 1965 and 1970 inclusive, and silver dollars of any date. On a worksheet list the coins, each by face value and date. The order does not matter. For instance you might have eight coins and list them as follows:

10	1963
25	1959
50	1967
50	1960
100	1971
5	1948
10	1963
25	1961

Note that silver dollars are entered as "100". In this manner list the entire collection of coins whose melt value you wish to have computed. Now you are ready to turn the job over to your microcomputer.

With your computer on and Pascal up and running, press "X" in the command mode and when the screen displays "Execute what?" type "Silvercoin" and then simply interact with your computer according to the program prompts that will be displayed. The initialization procedure (routine) asks whether you want hard copy or not; a "yes" reply will provide you a printout of results (see Sample Runs). Next you will be asked the total number of coins being run, and the current spot silver price. The latter can be found in the financial pages of your local newspaper or by phoning your bank or brokerage office.

Next you will be asked to list the coins as described earlier, first being reminded that the program is "valid only if coins of 1964 and earlier vintage, unless half-dollars between 1965-70 or dollars of whatever date."

Now Pascal goes to work and, no matter how few coins you have, you are subject to a rather pleasant discovery — that inflation works two ways!

If you are a relative newcomer to Pascal, a study of the source text in the Program Listing can be enlightening. My own computer is the Apple II Plus with language card (48K bytes of RAM on board) and is interfaced to a Trendcom 100 scratch printer which I use primarily for listing programs and for debugging. Pascal encourages the division of lengthy, complex computing tasks into compact subroutine blocks (procedures and functions). In this program I used six procedures, each performing a specific task. Note, too, that Pascal lends itself to the use of mnemonic names and identifiers. "Listdata," "Accumulate," "Addfacevalue," and "Summarize" are examples in my program. The main program invokes these procedures as subroutines; the procedure calls utilizing the procedure names. This makes it easier for other programmers to follow the thread of the text.

Try this Pascal program on your own computer; discover the riches in this sophisticated computer language. What's more, discover the riches hidden in that coin bank or Mason Jar! □

Mr. Gaylord is a copy chief in a San Francisco ad agency.

Sample Run

COIN	DATE	OZ.SILVER	MELTVALUE
DIME	1962	0.072	3.02
QUARTER	1956	0.191	8.05
DOLLAR	1975	0.308	12.99
HALFDOLLAR	1968	0.149	6.29
HALFDOLLAR	1944	0.356	15.03
QUARTER	1953	0.191	8.05
TOTALS		1.266	53.42

NOTE: SILVER AT $ 42.19 PER OZ.
$ 2.60 TOTAL FACEVALUE

COIN	DATE	OZ.SILVER	MELTVALUE
NICKEL	1972	MINIMUM	NONE
DIME	1944	0.072	2.37
DOLLAR	1978	0.308	10.22
HALFDOLLAR	1967	0.149	4.95
HALFDOLLAR	1944	0.356	11.81
HALFDOLLAR	1962	0.356	11.81
QUARTER	1946	0.191	6.33
TOTALS		1.432	47.49

NOTE: SILVER AT $ 33.17 PER OZ.
$ 2.90 TOTAL FACEVALUE

Program Listing

```
(*$S+*)
PROGRAM COINSILVER,
VAR COIN:ARRAY[1..100]
         OF RECORD
              DENOMINATION:10..100;
              DATE:1900..1980;
              MELTVALUE:REAL;
              SILVERWEIGHT:REAL
            END;
    SILVERPRICE,TOTALVALUE,
    WEIGHTTOTAL,FACEVALUES:REAL;
    K,TOTALCOINS:1..100;
    P:TEXT; S:STRING;

    PROCEDURE INITIALIZE;
    VAR REPLY:STRING;
    BEGIN
      WRITELN;
      WRITE('WANT HARD COPY? ');
      READ(REPLY);
      IF REPLY='YES' THEN
        REWRITE(P,'PRINTER:')
      ELSE REWRITE(P,'CONSOLE:');
      WRITELN;
      WRITE('TOTAL NUMBER OF COINS? ');
      READ(TOTALCOINS);
      WRITE('CURRENT SILVER PRICE? ');
      READ(SILVERPRICE);
      WRITELN;
      WRITELN('VALID ONLY IF COINS OF 19
64');
      WRITELN('AND EARLIER VINTAGE, UNLE
SS');
      WRITELN('HALFDOLLARS BETWEEN 1965-
70');
      WRITELN('OR DOLLARS OF WHATEVER DA
TE');
      WRITELN;
      WRITELN('ENTER DENOMINATION (IN CE
NTS)');
      WRITELN('FOLLOWED BY MINT DATE');
      K:=1;TOTALVALUE:=0;
      WEIGHTTOTAL:=0;FACEVALUES:=0
    END;

    PROCEDURE ACCUMULATE(SWT,MVL:REAL);
    BEGIN
      WEIGHTTOTAL:=WEIGHTTOTAL+SWT;
      TOTALVALUE:=TOTALVALUE+MVL
    END;

    PROCEDURE ADDFACEVALUE(D:INTEGER);
    BEGIN
      FACEVALUES:=FACEVALUES+D
    END;

    PROCEDURE SUMMARIZE;
    BEGIN
      WRITELN(P,'----------------------
----------------');
      WRITELN(P,'TOTALS',WEIGHTTOTAL:20:
3,              TOTALVALUE:12:2);
      WRITELN(P);WRITELN(P);WRITELN(P);
      WRITELN(P,'   NOTE: SILVER AT $',S
ILVERPRICE:1:2,' PER OZ.');
      WRITE(P,'         $',FACEVALUES/10
0:1:2,' TOTAL FACEVALUE');
      WRITELN(P)
    END;

    PROCEDURE HEADING;
    BEGIN
      PAGE(OUTPUT);WRITELN;
      WRITELN;WRITELN(P);
      WRITELN(P,'COIN          DATE  OZ.S
ILVER   MELTVALUE');
      WRITELN(P,'----------------------
----------------');
    END;

PROCEDURE COINNAME;

  PROCEDURE LISTDATA;
  BEGIN
    WITH COIN[K] DO
    BEGIN
      WRITE(P,S);
      WRITE(P,DATE:17-LENGTH(S));
      IF SILVERWEIGHT=0 THEN
        WRITE(P,'MINIMUM':10)
      ELSE WRITE(P,SILVERWEIGHT:9:3)

      IF MELTVALUE=0 THEN
        WRITELN(P,'NONE':11)
      ELSE WRITELN(P,MELTVALUE:12:2)
    END
  END;


BEGIN
  K:=1;
  REPEAT
    WITH COIN[K] DO
      CASE DENOMINATION OF
        100:BEGIN S:='DOLLAR';
            LISTDATA END;
         50:BEGIN S:='HALFDOLLAR';
            LISTDATA END;
         25:BEGIN S:='QUARTER';
            LISTDATA END;
         10:BEGIN S:='DIME';
            LISTDATA END;
          5:BEGIN S:='NICKEL';
            LISTDATA END
      END;
      K:=K+1
  UNTIL (K>TOTALCOINS) OR (K>100)
  END;

BEGIN
  INITIALIZE;
  REPEAT
    WRITE('--> ');
    WITH COIN[K] DO
    BEGIN
      READLN(DENOMINATION,DATE);
      ADDFACEVALUE(DENOMINATION);
      CASE DENOMINATION OF
        5:BEGIN
            IF(DATE>=1942)AND(DATE<=1945
) THEN
              SILVERWEIGHT:=5.538E-2
            ELSE SILVERWEIGHT:=0
          END;
       10:SILVERWEIGHT:=7.154E-2;
       25:SILVERWEIGHT:=1.907E-1;
       50:IF DATE<=1935 THEN
            SILVERWEIGHT:=7.623E-1
          ELSE IF (DATE>1935)AND(DATE<
1965) THEN
            SILVERWEIGHT:=3.5615E-1
            ELSE IF (DATE>1964)AND(DAT
E<1971) THEN
              SILVERWEIGHT:=1.492E-1;
      100:SILVERWEIGHT:=3.08E-1
      END; (*CASE*)
      MELTVALUE:=SILVERWEIGHT*SILVERPRIC
E;
      ACCUMULATE(SILVERWEIGHT,MELTVALUE)
    END; (*WITH*)
    K:=K+1
  UNTIL (K>TOTALCOINS)OR(K>100);
  HEADING;
  COINNAME;
  SUMMARIZE
END.
```

A COMP?TER SPEL?ING EXERCI?E

BY JEREMY C. JONES

Stimulate interest in spelling by putting the spelling practice into the form of a word recognition game. While this program is designed primarily for children learning to spell, it can be easily modified to be more challenging with harder words and more missing letters.

Designed to run on standard Basic as much as possible, the program has been running on both Ohio Scientific ROM and disk-based computer systems.

The exercise starts by selecting a word from a word list. This word is then displayed with a randomly chosen letter missing. The computer asks you for the missing letter. After three tries, the system advances to the next randomly chosen word.

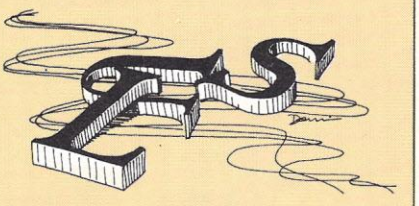
Scoring is very easy to add by putting counters in the right answer section and in the new word generation section. Scores may be used to add difficulty feedback for the student. This may be done by (1) selecting shorter or longer words depending on the person's score, (2) having the DATA file of words consist of increasingly difficult words from the beginning to the end of the file. In either case, the purpose is motivation. It's clear that too easy a spelling quiz is boring, and that too hard a quiz is frustrating. By adjusting the difficulty, you can stay between too hard and too easy and avoid a boring and frustrating exercise. □

Jeremy Jones is Program Advisor to the Computer Science Program at Chaminade University of Honolulu, and also owns and manages an Ohio Scientific computer store. He is a flight instructor, retired professional trombonist and has graduate degrees in mathematics and physics.

Sample Run

```
COM?UTER
WHAT'S THE MISSING LETTER ?P
YOU'RE RIGHT!
P?RSON
WHAT'S THE MISSING LETTER ?A
LET'S TRY IT AGAIN
WHAT'S THE MISSING LETTER ?E
YOU'RE RIGHT!
OW?
WHAT'S THE MISSING LETTER ?E
LET'S TRY IT AGAIN
WHAT'S THE MISSING LETTER ?N
LET'S TRY IT AGAIN
WHAT'S THE MISSING LETTER ?S
THIS ONE IS PRETTY HARD
LET'S TRY ANOTHER ONE. OK?
ARITH?ETIC
WHAT'S THE MISSING LETTER ?M
YOU'RE RIGHT!
```

Program Listing



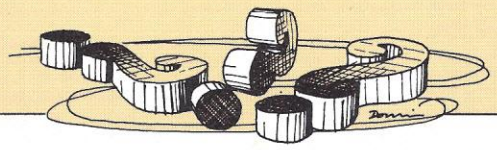
```
10 REM-- SPELLING QUIZ
20 REM   JEREMY JONES 11-28-79
30 REM   808-732-5246
40 REM   COMPUTER SCIENCE PROGRAM
50 REM   CHAMINADE UNIVERSITY
60 REM   HONOLULU, HAWAII  96816
70 MG = 2 : REM SET MAXIMUM NUMBER OF TRIES PERMITTED
80 DEF FNR(X) = INT(1+RND(1)*X)
90 REM GENERATES RANDOM INTEGERS
100 REM FROM 1 THROUGH X    TO BE USED FOR
110 REM SELECTING WORDS AND LETTERS
120 REM RANDOMLY. NOTE: SOME BASICS REPLACE
130 REM RND(1) WITH RND(0) AND BEGIN WITH
140 REM THE KEYWORD RANDOMIZE
150 REM-- COUNT WORDS IN LIST
160 N = 0 : REM CLEAR COUNTER FOR COUNTING
170 READ D$ : REM GET NEXT SPELLING WORD
180 : IF D$="EOF" THEN 210 : REM EXIT WITH COUNT WHEN DONE
```

Continued

Illustrated by Donni Richman

Program Listing (continued)

```
190 : N = N + 1 : REM COUNT EACH WORD IN THE DATA FILE
200 GOTO 170 : REM GO COUNT THE NEXT SPELLING WORD
210 RESTORE : REM REQUIRED FOR REREADING THE WORD FILE
220 FOR I = 1 TO FNR(N) : REM GET RANDOM WORD
230 : READ W$ : REM READ DOWN THROUGH FILE TO GET WORD
240 NEXT I
250 LW = LEN(W$) : REM FIND LENGTH OF SPELLING WORD
260 RL = FNR(LW) : REM PICK RANDOM LETTER FROM WORD
270 L$ = MID$(W$,RL,1) : REM PICK OUT MISSING LETTER FROM WORD
280 REM-- DISPLAY WORD WITH MISSING LETTER
290 NG = 0 : REM PREPARE TO COUNT NUMBER OF GUESSES
300 FOR I = 1 TO LW : REM SCAN THROUGH THE WORD
310 : C$ = MID$(W$,I,1) : REM PICK OUT EACH LETTER FROM WORD
320 : IF I = RL THEN C$ = "?" : REM REPLACE ONE LETTER WITH ?
330 : PRINT C$;
340 NEXT I
350 PRINT: PRINT: PRINT : REM THREE LINE FEEDS
360 PRINT " WHAT'S THE MISSING LETTER ";
370 INPUT G$ : REM GET THE PERSON'S GUESS
380 NG = NG + 1 : REM COUNT NUMBER OF GUESSES
390 REM SCORE KEEPING COUNTERS COULD BE INSERTED IN THIS SECTION
400 IF G$ = L$ THEN PRINT:PRINT " YOU'RE RIGHT! ": GOTO 480
410 IF NG > MG THEN 440 : REM TOO MANY TRIES = TOO HARD
420 PRINT: PRINT"LET'S TRY IT AGAIN ": PRINT
430 GOTO 360 : REM LET THE PERSON TRY AGAIN
440 REM--- OUT OF TRIES SECTION
450 PRINT: PRINT
460 PRINT"THIS ONE IS PRETTY HARD."
470 PRINT" LET'S TRY ANOTHER ONE. OK?": PRINT: PRINT
480 REM--- GO TRY ANOTHER SPELLING WORD SECTION
490 GOTO 210
500 REM ------ INSERT YOUR OWN WORD LIST HERE ----------
510 DATA APE, ELEPHANT, COMPUTER, SCHOOL, OWL
520 DATA THINK, HOME, RAIN, WRITE, TELEPHONE
530 DATA ONLY, MATHEMATICS, ARITHMETIC, CLASS
540 DATA CLOWN, MACDONALDS, HAMBURGER, SHAKE
550 DATA FOOD, ANIMAL, PERSON, SPAGHETTI, NOODLE
600 DATA EOF : REM --- EOF MARKS THE END OF OUR SPELLING FILE
```



Share Your Home Programs

How do *you* use your computer at home? Family finances? Budgets? Meal planning? Entertainment? Teaching the kids? Word processing? Home security? Investment planning? Helping with your *other* hobby?

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All submissions should be original, typed (not all CAPS), double-spaced and neat. Include your name and address on the first page of the article and enclose a self-addressed, stamped envelope for return of material. Also, please use a fresh ribbon on your printer for program listings and sample runs.

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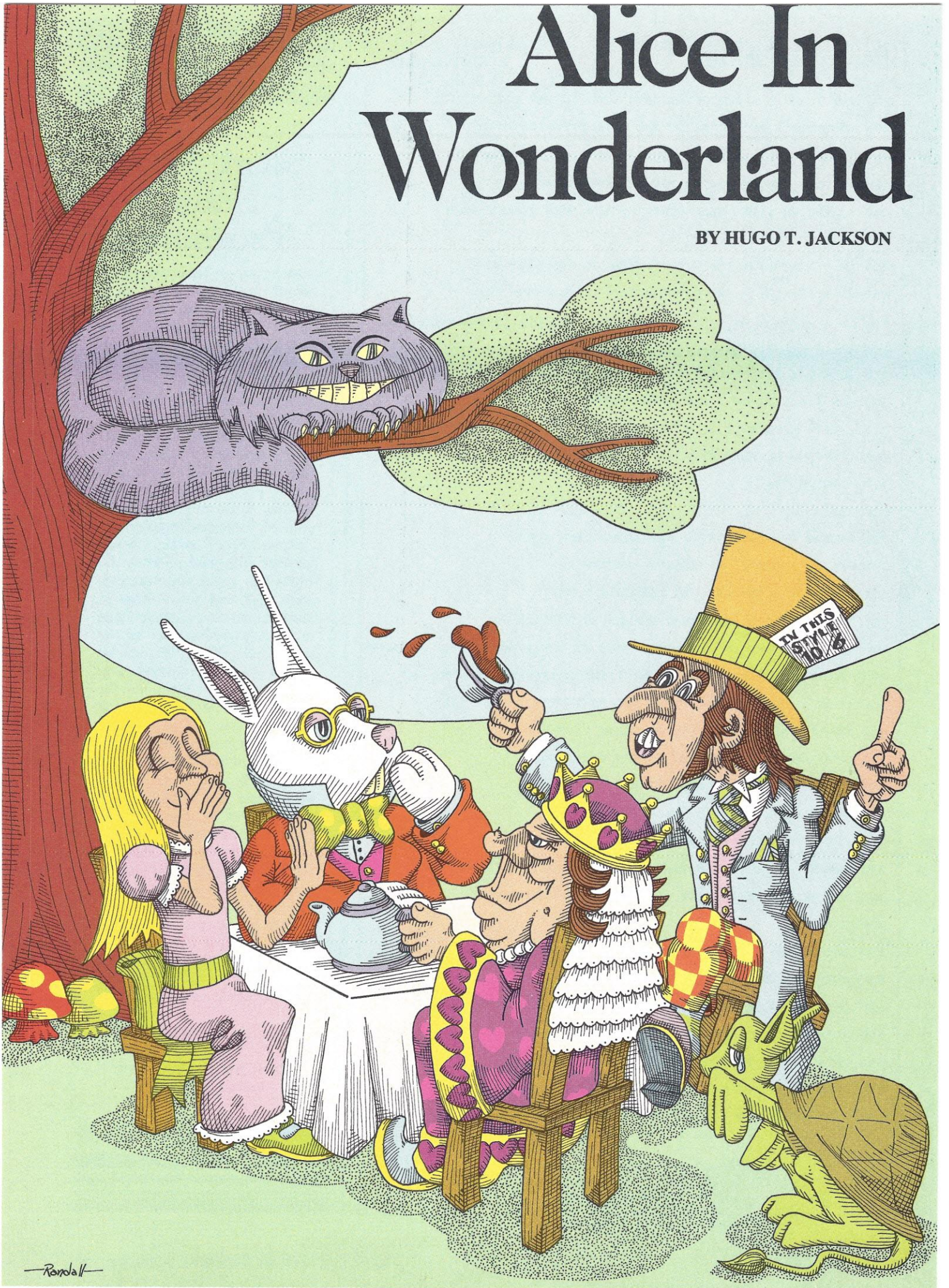
1050 Commonwealth Ave.
Boston, MA 02215

Alice In Wonderland

BY HUGO T. JACKSON



Having worked on large mainframe machines for many years, I admit I was quite smug in my condemnation of computer games, which I thought were a rather sad application of human intellect. But give purists their own computers to play with and I'll guarantee one of the first ten programs they'll write will be a game. At least that's the way it was with me, except that this game was the second program I wrote. So much for strength of character!

"Alice in Wonderland" was inspired by the February 1978 cover of *Personal Computing*, which called to mind the trials and tribulations Alice experienced in her quest to find home after falling down the rabbit hole. On reflection, I realized the scenario was aptly suited to computer adaptation.

Though I was very anxious to remain faithful to the book, I had at the time only 4K of memory to work with so it became necessary to limit the game's complexity. If you have more memory at your disposal, I urge you to develop and implement the suggestions at the end of this article for expansion of the basic game.

The object of the game is for you (in the role of Alice) to find the Rabbit before finding the Queen. Four additional factors will hinder your finding the Rabbit, but I'll tell you about them later.

The "playing board" (see Figure 1) can best be described as a large, six-sided polygon which is subdivided into a number of equilateral triangles. At each angle and at each intersection is a room. The rooms are numbered from one to nineteen, and each room is connected by tunnels to the other rooms. Alice moves from room to room, finding out as she goes whether any of the other game characters are behind one of the doors available. By logic or by chance, Alice must choose the path which will lead her to the Rabbit.

The four characters in "Alice in Wonderland" are the Rabbit, the Queen, the Mad Hatter and, of course, Alice. The placement and subsequent movement of the individual pieces are as follows.

The Mad Hatter is one of the complications I spoke of earlier. He is randomly in one of the nineteen rooms at the beginning of the game. Upon completion of every turn, he is randomly relocated but will never be placed in the same room with Alice or the Queen. If Alice enters the room the Mad Hatter presently occupies every piece will be randomly repositioned on the board (including Alice). The purpose of the Mad Hatter is to destroy any logical constructions you may have made with respect to the location of the Queen or the Rabbit. *Warning:* The Mad Hatter could well be sharing a square with the Rabbit. You do not win the game if you enter the Rabbit's room when the Mad Hatter is there as well. While the computer will tell you that the rabbit was there, all the pieces will be relocated. Should you ever encounter this situation, try to control the urge to put your fist through the video monitor.

"I've often seen a cat without a grin . . .but a grin without a cat?" — Alice

The Queen is placed in one of the nineteen rooms at the beginning of the game. She will remain there unless Alice meets with the Mad Hatter, in which case she will be relocated. Should Alice meet with the Queen, you lose the game.

The Rabbit is placed and relocated according to the same criteria as the Queen. If Alice finds the Rabbit, you've demonstrated your superior capacity for higher level logic by having won the game.

Alice is placed in one of the nineteen rooms at the beginning of the game. From that point, however, you choose the path Alice will take. From the doors displayed, the computer will ask you to choose one. This procedure will continue, with Alice going from room to room until you encounter one of the other characters.

At this point, you may wonder how much skill is required for winning the game. Rest assured that it's not as easy as it appears — for in addition to the Mad Hatter there's another complication to diminish your chances of success.

If you've read *Alice in Wonderland*, you may recall that the doors through which she travelled were of different sizes. As it was in the book so it is in this game. At the beginning of each game the computer determines whether Alice is to be large or small. If she is small, she cannot pass through a large door and similarly if she is large she is unable to pass through a small door.

Lest you feel that the introduction of this underhanded aspect of the game now makes it too difficult, you are provided with three "eat me's" and three "drink me's" at the beginning of the game. As in the book, a "drink me" will make Alice small if she is large, and an "eat me" will make her large if she is small. The computer will automatically decrement the correct counter when you pass through a door that is not compatible with her current physical size.

Warning: Should you use up all your "eat me's" or "drink me's", you can only pass through those doors which are the same size as Alice. As the door sizes are randomly determined before each turn, you could well be presented with doors which are all of the same size. If this happens after you have used up all your food and are unable to pass through any of the doors because of your present size, the game is stalemated and ends. While this is not as bad as running into the Queen, it may indicate that a new strategy is required.

This program was originally written on a TRS-80 with Level I Basic and 4K of RAM. Since that time, however, I've upgraded my machine to Level II. The Program Listing shows the Level II program. Level I owners will need to delete the DIMension statement and replace the logical AND and OR operators with Level I's "*" and "+". If you have only 4K of RAM, you'll need to use all the Level I command contrac-

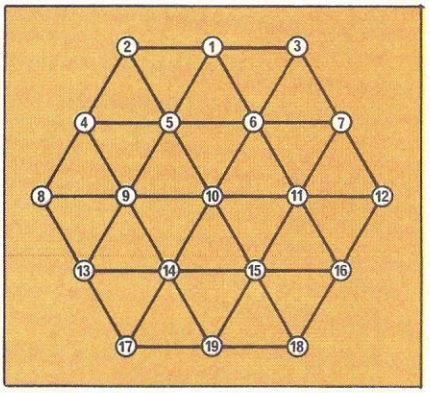


Figure 1: The "playing board" showing all nineteen rooms and the connecting corridors. I have found the game to be a lot more interesting if it is played without the benefit of this "map."

Hugo Jackson is a freelance writer and forms analyst with the Canadian federal government. He is currently working on an instruction manual that will serve as a basic introduction to Z-80 Assembler language.

Illustrated by Josh Randall

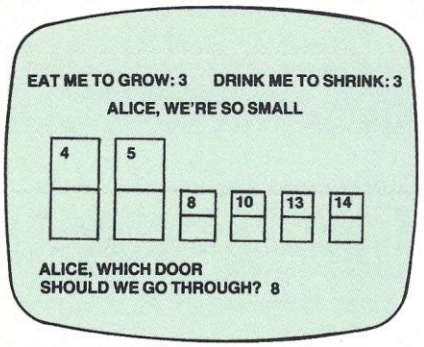


Figure 2: You're down the rabbit hole and at the moment you have six doors from which to choose. As you are "small," the decision to enter doors 4 or 5 will result in you having to take an "EAT ME" in order to pass through these large doors.

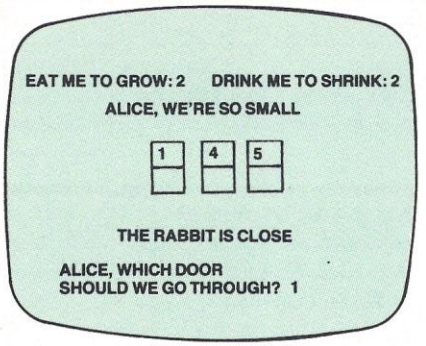


Figure 3: Later in the game, you have already hit the Mad Hatter and barely escaped being caught by the Queen. You have used an "EAT ME" and a "DRINK ME" and you now have only two of each left. There are three doors and one leads to the Rabbit.

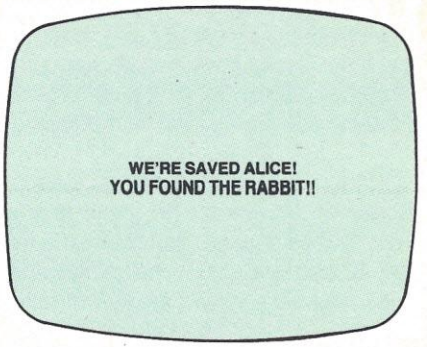


Figure 4: Congratulations! You were right. The Rabbit was indeed hiding behind door number 1. You win the game . . .but was it skill or luck? How can you be sure? Perhaps you will think twice before you jump down the rabbit hole again!

tions to get the whole program to fit in your machine. As the program is fairly straightforward, owners of other computers should experience little difficulty in adapting this game to their own machine.

In developing this program, as with others I have tackled, I was faced with the choice of making the program either more intricate or more interactive. As I favor interaction, which is quite costly in terms of memory, I was unable to incorporate all the subtleties I would have liked. So I invite fellow programmers with more memory at their disposal to implement the following additions to "Alice In Wonderland":

Cheshire Cat: I envision the Cheshire Cat's role as one of a red herring: If Alice is in a room with a door that leads to the Cheshire Cat, you will be told that the Rabbit is near. How frustrating when, confident of success, you open the door only to find the Cheshire Cat. This might be a good place for rearrangement of the pieces.

Tweedledee and Tweedledum: They are placed together in the same room and upon meeting them Alice may ask either (but not both) one question: "Is the Rabbit in Room No. ??" The question will be answered by a "yes" or "no." To make it more intriguing, try programming them so that one twin tells the truth and the other always lies. This would be randomly determined at the start of each game. After Alice has left the twins, they should be randomly relocated on the board. To complicate matters even more, Tweedledee and Tweedledum should be unable to differentiate between the Rabbit and the Cheshire Cat. Remember, even if Alice is able to determine the Rabbit's position from Tweedledeee and Tweedledum, she still must reach the Rabbit and there's still the Mad Hatter to contend with.

Those are just two suggestions as to how you might improve or expand the game. If you have more memory than you know what to do with (unlikely), a quick review of Lewis Carroll's book should provide you with a lot more ideas on how to make "Alice in Wonderland" even more interesting and challenging. □

Program Listing

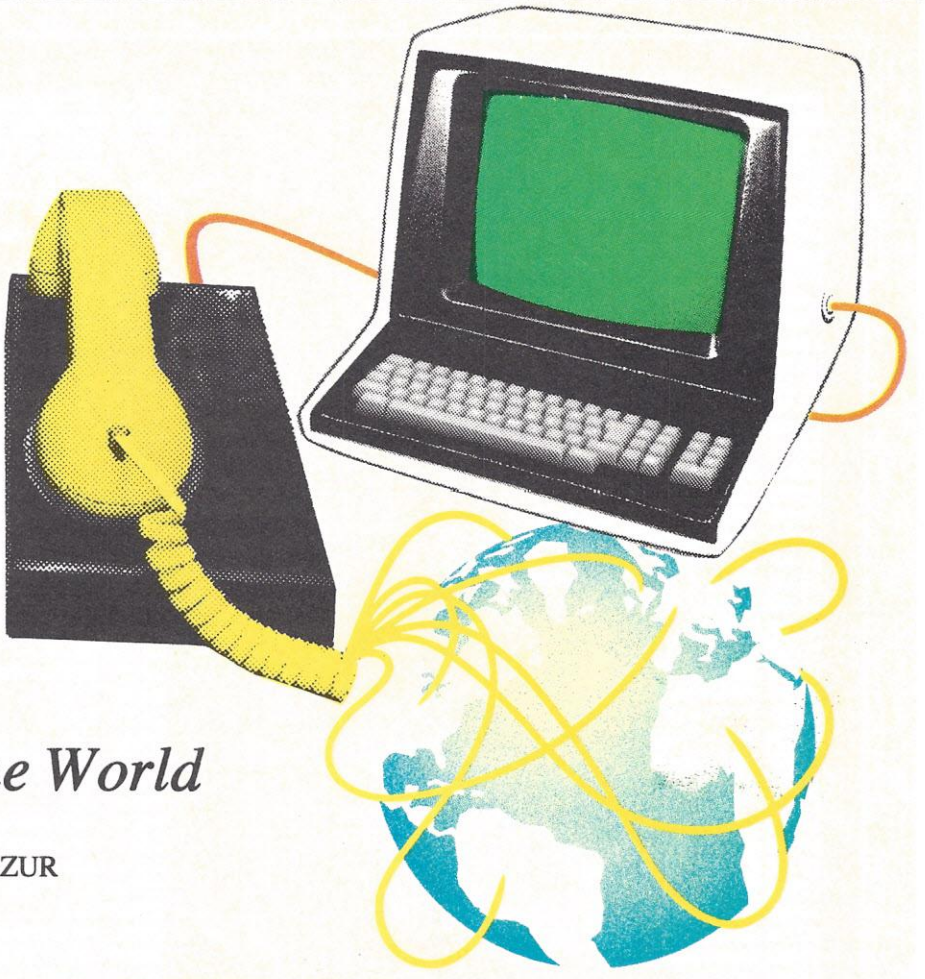
```
100 REM*****************************************
110 REM
120 REM            ALICE IN WONDERLAND
130 REM
140 REM             BY HUGO T. JACKSON
150 REM
160 REM*****************************************
170 REM
180 REM    ASSIGNMENT OF VARIABLES:
190 REM
200 REM    D = CURRENT POSITION OF ALICE
210 REM    L = INPUT VALUE FOR ALICE'S MOVE
220 REM    A = RABBIT'S POSITION
230 REM    B = QUEEN'S POSITION
240 REM    C = MAD HATTER'S POSITION
250 REM
260 REM*****************************************
270 '
280 '
1000 DIMA(100)
1010 FORX=1TO192
1020 PRINT" *ALICE IN WONDERLAND*";
1030 NEXTX
1040 FORX=1TO1000:NEXTX
1050 FORX=1TO16:PRINT:NEXTX
1060 PRINT@463,"AND IT'S DOWN
     THE RABBIT HOLE WE GO"
1070 FORX=1TO2000:NEXTX
1080 FORX=1TO16:PRINT:NEXTX
1090 CLS
1100 E=3
1110 F=3
1120 P=0
1130 K=RND(2)
1140 IFK=1PRINT@469,"ALICE, WE'RE SO SMALL!"
1150 IFK=2PRINT@469,"ALICE, WE'RE ENORMOUS!"
1160 FORX=1TO1000:NEXTX
1170 REM*** PLAYER ***
1180 D=RND(19)
1190 L=D
1200 REM*** RABBIT ***
1210 A=RND(19)
1220 IFA=DGOTO1210
1230 REM*** QUEEN ***
1240 B=RND(19)
1250 IF(B=D)+(B=A)GOTO1240
1260 REM*** MAD HATTER ***
1270 C=RND(19)
1280 IF(C=D)+(C=B)GOTO1270
1290 CLS
1300 PRINT@466,"NOW WHERE DOES THIS LEAD TO?"
1310 FORG=1TO500:NEXTG
1320 REM***CLEAR ARRAY***
1330 FORG=1TO19
1340 A(G)=0
1350 NEXTG
1360 REM*** DOORS & SIZE ***
1370 J=0
1380 RESTORE
```

continued

```
1390 FORG=1TO103
1400 READH
1410 IFH-100<>LNEXTG
1420 READH
1430 IFH>100GOTO1470
1440 J=J+1
1450 A(H)=RND(2)
1460 GOTO1420
1470 REM***PRINT THE DOORS***
1480 CLS
1490 Z=(128-(21*J))/2
1500 W=Z/2+196
1510 FORG=1TO19
1520 IFA(G)=0GOTO1790
1530 IFA(G)=1GOTO1660
1540 PRINT@W,G;
1550 FORY=7TO27
1560 SET(2+Z,Y)
1570 SET(21+Z,Y)
1580 NEXTY
1590 FORX=2+ZTO21+Z
1600 SET(X,6)
1610 SET(X,17)
1620 SET(X,27)
1630 NEXTX
1640 SET(Z+17,20)
1650 GOTO1770
1660 PRINT@W+192,G;
1670 FORY=17TO27
1680 SET(7+Z,Y)
1690 SET(16+Z,Y)
1700 NEXTY
1710 FORX=8+ZTO16+Z
1720 SET(X,17)
1730 SET(X,21)
1740 SET(X,27)
1750 NEXTX
1760 SET(X-2,23)
1770 Z=Z+21
1780 W=W+10.5
1790 NEXTG
1800 REM***WHO IS CLOSE***
1810 FORG=1TO19
1820 IFA(G)=0GOTO1860
1830 IFG=APRINT@662,"THE RABBIT IS CLOSE"
1840 IFG=BPRINT@727,"THE QUEEN IS NEAR"
1850 IFG=CPRINT@788,"THE MAD HATTER IS NEARBY"
1860 NEXTG
1870 REM******SHOW THE COUNT******
1880 PRINT@0,"EAT ME TO GROW: "
1890 PRINT@16,F
1900 PRINT@36,"DRINK ME TO SHRINK: "
1910 PRINT@56,E
1920 IF K=1 PRINT@81,"ALICE, WE'RE SO SMALL";
1930 IF K=2 PRINT@81,"ALICE, WE'RE ENORMOUS";
1940 REM***INPUT THE TURN***
1950 PRINT@832," "
1960 PRINT@896," "
1970 PRINT@960,"                              ";
1980 PRINT@831," ";
1990 INPUT"ALICE, WHICH DOOR SHOULD
     WE GO THROUGH";L
2000 IFINT(L)=LGOTO2040
2010 PRINT@832,"ALICE, THIS IS HARDLY
     THE TIME FOR JOKES"
2020 FORG=1TO2000:NEXTG
2030 GOTO1950
2040 IF(L<1)+(L>19)GOTO2010
2050 IFA(L)<>0GOTO2100
2060 PRINT@832,"BUT ALICE, THERE'S NO DOOR
     LEADING TO THERE!"
2070 FORG=1TO2000
2080 NEXTG
2090 GOTO1950
2100 IFA(L)=KGOTO2480
2110 IFK=2GOTO2300
2120 IFF<>0GOTO2260
2130 FORG=1TO19
2140 IFA(G)=1GOTO2220
2150 NEXTG
2160 CLS
2170 PRINT@340,"I GUESS THAT'S IT FOR US!"
2180 PRINT@403,"ALL THE DOORS ARE ENORMOUS,"
2190 PRINT@473,"AND WE'RE TINY"
2200 PRINT@529,"AND WE'RE ALL OUT OF EAT ME'S"
2210 GOTO2710
2220 PRINT@832,"WE'RE OUT
     OF EAT ME'S ALICE,
     WE CAN'T GO THERE"
2230 FORG=1TO1000
2240 NEXTG
2250 GOTO1950
2260 F=F-1
2270 K=2
2280 P=1
2290 GOTO2480
2300 IFE<>0GOTO2440
2310 FORG=1TO19
2320 IFA(G)=2GOTO2400
2330 NEXTG
2340 CLS
2350 PRINT@413,"THAT'S IT"
2360 PRINT@469,"ALL THE DOORS ARE TINY"
2370 PRINT@538,"WE'RE SO BIG"
2380 PRINT@591,"AND WE'VE FINISHED OFF
     THE DRINK ME"
2390 GOTO2710
2400 PRINT@832,"THERE'S NO DRINK ME LEFT,
     WE CAN'T GO THERE"
2410 FORG=1TO1000
2420 NEXTG
2430 GOTO1950
2440 E=E-1
2450 K=1
2460 P=1
2470 GOTO2480
2480 IFL<>8GOTO2530
2490 CLS
2500 PRINT@405,"CURTAINS FOR US ALICE!"
2510 PRINT@473,"IT'S THE QUEEN!"
2520 GOTO2710
2530 IFL<>CGOTO2610
2540 CLS
2550 PRINT@403,"OH NO, IT'S THE MAD HATTER!"
2560 IFL<>AGOTO2580
2570 PRINT@463,"AND ALICE, THE RABBIT WAS
     THERE!!!"
2580 FORG=1TO1000
2590 NEXTG
2600 GOTO1170
2610 IFL<>AGOTO2660
2620 CLS
2630 PRINT@407,"WE'RE SAVED ALICE!"
2640 PRINT@469,"YOU FOUND THE RABBIT!!"
2650 GOTO2710
2660 D=L
2670 IFP<>1GOTO2700
2680 P=0
2690 GOTO1230
2700 GOTO1260
2710 FORX=1TO4000:NEXTX
2720 CLS
2730 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
2740 INPUT"            WOULD YOU LIKE TO PLAY
     AGAIN";A$
2750 CLS
2760 IF A$="YES" OR A$="Y" GOTO 1060
2770 CLS
2780 PRINT@473,"BE SEEING YOU!"
2790 PRINT:PRINT:PRINT:PRINT:PRINT
2800 DATA101,2,3,5,6
2810 DATA102,1,4,5
2820 DATA103,1,6,7
2830 DATA104,2,5,8,9
2840 DATA105,1,2,4,6,9,10
2850 DATA106,1,3,5,7,10,11
2860 DATA107,3,6,11,12
2870 DATA108,4,9,13
2880 DATA109,4,5,8,10,13,14
2890 DATA110,5,6,9,11,14,15
2900 DATA111,6,7,10,12,15,16
2910 DATA112,7,11,16
2920 DATA113,8,9,14,17
2930 DATA114,9,10,13,15,17,19
2940 DATA115,10,11,14,16,18,19
2950 DATA116,11,12,15,18
2960 DATA117,13,14,19
2970 DATA118,15,16,19
2980 DATA119,14,15,17,18
2990 DATA200
```

continued

Modems



Your Link to the World

BY KEN MAZUR

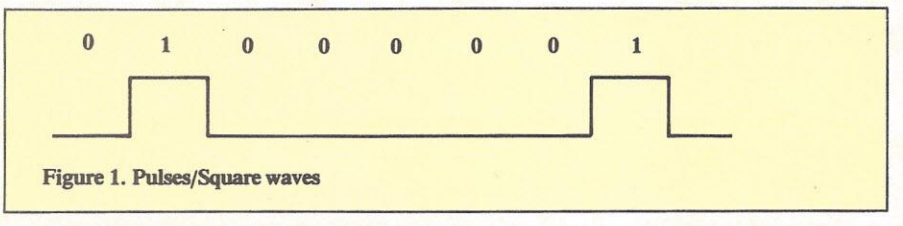


Figure 1. Pulses/Square waves

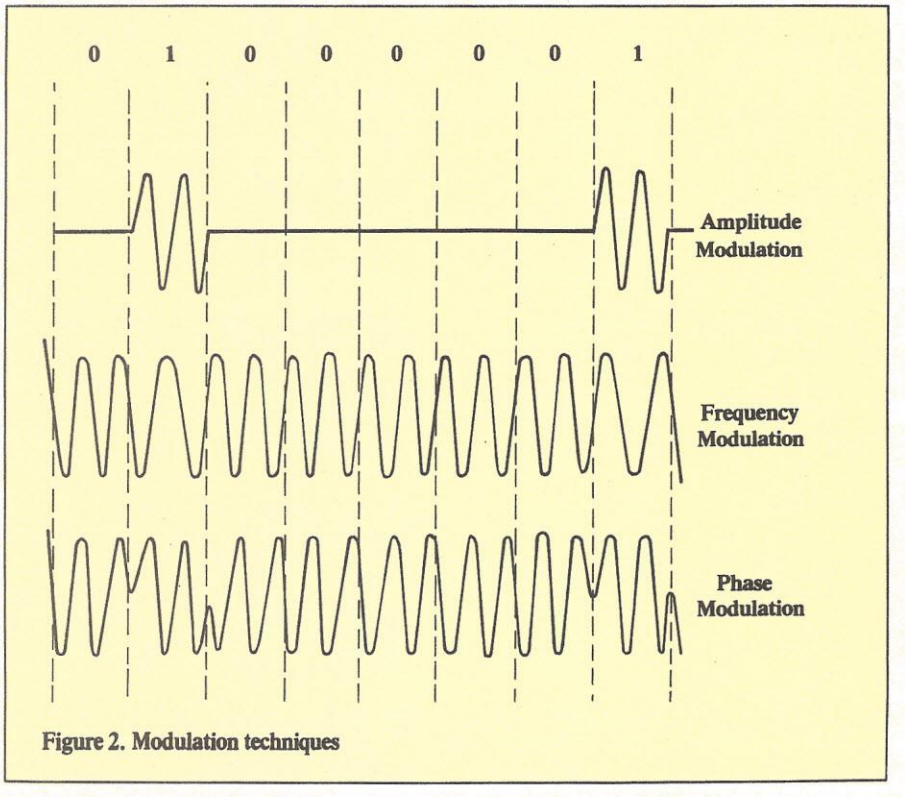


Figure 2. Modulation techniques

Hello? Hello? Mainframe, are you there?

When you use your microcomputer system to "talk" to other micros or mainframe machines over standard telephone lines, you have to get involved with a piece of equipment known as a "modem." With a modem, you can change your micro from an isolated unit to one that can link its capabilities to other machines of a similar nature or even tie into mainframe units located hundreds of miles away.

To link into the two most prominent, consumer oriented microcomputer networks (CompuServe Information Service and The Source; for a detailed explanation of networking see the September issue of *Personal Computing*), your modem must have the following characteristics: it must be capable of transmitting data at up to 300 bits per second (often referred to as 300 baud); it should be a full duplex model (CIS can handle a half duplex unit but full duplex is recommended by the firm); it must be able to operate in an originate mode; and it must be compatible with the Bell 103 modem. You also need a serial interface.

For a person shopping for a modem, modem terminology might be confusing. To resolve some of the confusion, let's cover the basic principles of

modems first and then discuss characteristics that may vary from unit to unit.

A modem serves two basic functions: it converts the digital signals used by your microcomputer (or terminal) into a form that can be transmitted over standard telephone lines; and it takes signals coming over a phone line and converts the signals into a form that your computer will recognize. The process of conversion is called modulation while the decoding process is known as demodulation — hence *mo*dulator/*dem*odulator or *modem*.

The need for a device to translate signals arises from the differences between the signals a microcomputer uses and the signals of a standard, voice-grade telephone line. Your computer recognizes signals called pulses or square waves (see Figure 1). A pulse is there or it isn't; there's no in between. Your telephone line, on the other hand, is designed to carry analog signals which are represented by means of continuously variable physical quantities. To illustrate, a digital signal may have a "high" represent a 1 (or a "yes" or an "on") and a "low" represent a 0 (or a "no" or an "off"). Those are the only two distinctions a digital signal can make. An analog signal not only has highs and lows, but can take on values in between as well.

The basis of an analog signal is a continuously cycling voltage known as a carrier signal. For any given communications line, the volume (amplitude) and tone or pitch (frequency) of the carrier signal is constant. A carrier signal conveys no information by itself, but by altering one of the characteristics (amplitude or frequency) of the signal, information can be transmitted over the lines. Altering these characteristics to convey information is known as modulation. In short, you're modifying the signal.

There are three commonly used techniques of modulation (see Figure 2): amplitude modulation (you vary the "volume" of the carrier signal so that one volume represents a digital 1 and another indicates a 0); frequency modulation (you have the frequency of the carrier signal represent a digital 1 while an increased frequency denotes a 0); and phase modulation (you alter the rhythm of the carrier signal). Of the three techniques, frequency modulation is most commonly used for modems that transmit at 300 bits per second (bps) or less. In the frequency modulation technique called frequency shift keying, you can increase the frequency of the carrier signal to represent a digital 0 and let the original frequency

Modem Glossary

Acoustic coupler — A variety of modem that uses a conventional telephone handset. The handset is usually placed in rubber cups protruding from the modem.

Amplitude modulation — A method of transferring data via modem in which the amplitude (loudness or volume) of a carrier signal is altered to represent digital 0s and 1s. Abbreviated AM.

Analog signal — A signal that can take on any value within a given range. (Compare with *Digital signal*.)

Asynchronous transmission — Data transmission in which each character has its own start and stop bits and there is no control over the time between characters.

Baud — A unit for measuring data transmission speed. Baud and bits per second (bps) are often used interchangeably.

Bell-compatible modem — A modem whose phone line audio signals meet Bell Telephone standards.

Carrier signal — A signal that contains no information by itself but whose characteristics can be altered to carry data.

Digital signal — A signal that takes on two distinct values representing binary 0s and 1s. (Compare with *Analog signal*.)

Frequency modulation — The most common method of transferring data via modem, in which the frequency (pitch or tone) of a carrier signal is altered to represent digital data's 0s and 1s. Abbreviated FM.

Frequency Shift Keying — A method of data transmission in which a carrier signal's frequency shifts back and forth between two distinct frequencies to designate 0s and 1a. Abbreviated FSK.

Full duplex — Pertains to the simultaneous, independent transmisssion of data in both directions over a communications line.

Half-duplex — Pertains to the operation of a communications link in either direction over a single channel but not in both directions simultaneously.

Hard-wired modem — A variety of modem that connects directly to a phone line, usually by plugging into the telephone's wall receptacle.

Mainframe — Synonymous with Central Processing Unit (CPU); however, with the proliferation of microcomputers, "mainframe" is often used to refer to large computer systems.

Modem — An acronymn for *mo*dulator-*dem*odulator; a device used at each end of a telephone line to convert binary digital data to audio tones suitable for transmission over the line and vice versa.

Modulation — The process of altering the tone, volume or rhythm of a carrier signal to convey information.

Network — A system of interconnected computers and/or terminals. The two largest microcomputer consumer networks are CompuServe Information Service and The Source.

Originate/Answer — Two modes of operation for a modem. In the "originate" mode, the modem will utilize one set of frequencies to transmit data and another set of frequencies to receive data. In the "answer" mode, these frequency sets are reversed. For two modems to communicate, one modem must be in the "originate" mode while the other is in the "answer" mode.

Phase modulation — A method of transferring data via modem in which the rhythm of a carrier signal is altered to represent digital 0s and 1s. Abbreviated PM.

Pulse — An abrupt change in voltage (either positive or negative) that conveys digital information over a circuit.

Serial interface — Circuitry that transforms digital data from a parallel mode to a sequential mode. The most common serial interface is the RS-232.

Signal wave — An intentional disturbance in a communications line, as opposed to noise, which is an unwanted disturbance that may be caused by a number of factors.

Simplex — Pertains to a communications link that is capable of transmitting data in only one direction.

Start/stop bits — Bits transmitted immediately before and after a block (or character, in the case of asynchronous transmission) of data. The start bits alert the receiving system to expect incoming data while the stop bits signal the end of the transmission for that block.

Synchronous transmission - Data transmission in which the bits are transmitted at a fixed rate.

— By Ken Mazur

Lexicon acoustic coupler

of the signal convey a 1.

While all of this sounds pretty technical, a modem handles the process of coding and decoding the various signals so that you don't have to worry about how the process takes place.

Before we trace a typical transmission of a byte of data, there is one other alteration that has to take place before your computer can utilize the functions of a modem.

Most processes taking place in your microcomputer deal with bytes of information (normally eight bits although some CPU registers may be dealing with 16 bits). Because a phone line doesn't have at least eight parallel wires per cable to transmit eight bits at a time, the eight bits have to be transformed from a parallel configuration to a serial mode where each of the bits is transmitted one after the other instead of the eight going out simultaneously. The transformation from parallel to serial is most often handled by an RS-232 serial interface.

In very simplified terms, the following process takes place for the transmission of the letter "A". Your machine recognizes the character "A" (decimal 65 using the ASCII code) as an eight-bit configuration of 0 1 0 0 0 0 0 1 (step 1 of Figure 3). The byte "A" goes into the RS-232, which releases the bits in a serial fashion (step 2). The "pulses" of the RS-232 are received by the modem (step 3) and changed to acoustic tones for transmission over the telephone lines (step 4). When the tones reach the modem at the other end of your communications link, the reverse process occurs and an "A" is received.

While the above generally outlines the function all modems perform, there are characteristics of individual modems that vary from model to model. Some of the terms likely to be used when you are discussing the purchase of a modem will be: synchronous, asynchronous; simplex, half-duplex and full duplex; low speed, high speed; short-haul, long-haul; originate, answer; acoustic coupler and hard-wired modem. These terms may seem formidably electronic but essentially they are labels for easy-to-understand concepts.

There are basically two ways for a modem to handle the transmission of data: in uneven bursts or as a continuous stream. Data entered from a keyboard is of the burst nature because a human doesn't type in a mechanically-timed way. Data transmitted in a start-stop, start-stop fashion is called asynchronous. Data transmitted in a continuous stream (such as that from tape or disks) is referred to as synchronous.

Asynchronous transmission, in which the time interval between characters varies, is usually used for low speed transfer. Synchronization of the sending unit and the receiver is achieved by adding a bit pattern before each character transmitted. These bits, often called start-stop bits, alert the receiving unit that data will be transferred and thus establish the synchronization needed for the answering unit to interpret the data correctly. This type of transmission is ideal for data sent from a keyboard but doesn't utilize line capability very well because of the large overhead of start-stop bits that don't really have much to do with the actual data being sent.

Synchronous transmission uses line capabilities more efficiently but requires more complex circuitry and as a result the equipment generally costs more. Synchronization is achieved by using special bits at the beginning of each message, as opposed to each character. The data are sent at periodic intervals (as determined by some clocking source) in blocks such as the contents of a terminal buffer.

If you own a microcomputer or terminal that you've tied into a network like The Source or CIS, an asynchronous modem is the kind you'll want. If you own a larger business system which is used to transmit records from individual offices to a mainframe located in some other city, you should look into a synchronous modem.

Modems are also classified according to the direction of data travel. Simplex refers to modems that allow transmission in one direction or the

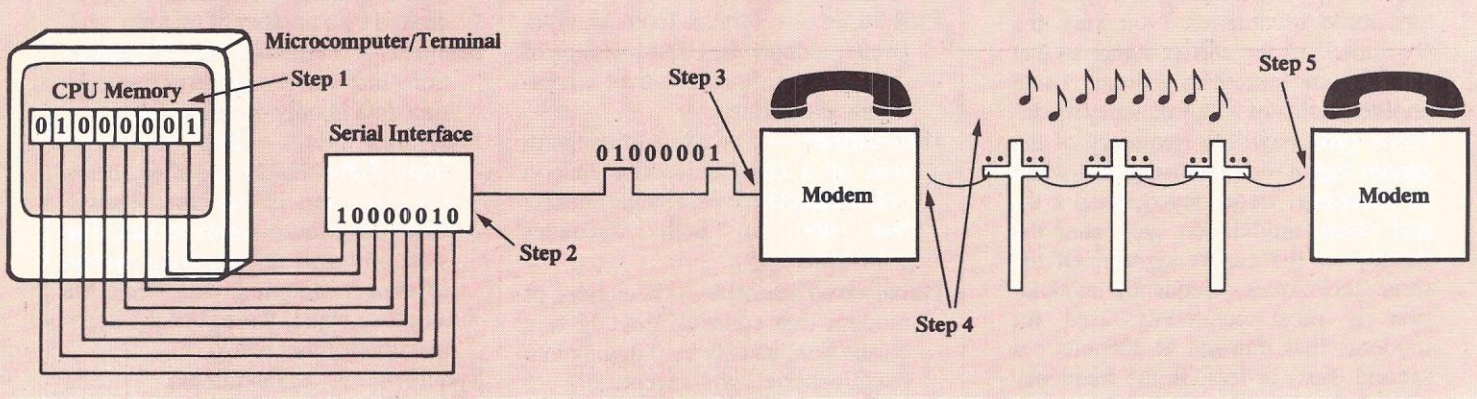


Figure 3. Signal conversion by modem: Step 1, bit configuration for the letter "A" as recognized internally by computer; Step 2, serial interface alters byte into serial configuration; Step 3, pulses from serial interface received by modem; Step 4, pulses changed to acoustic tones suitable for transmission over phone lines; Step 5, when tones are received by answering modem, the reverse process takes place.

other but not both. As a result, simplex modems aren't really used much anymore. A half-duplex system is one in which information may flow in either direction on the communication link but not simultaneously. A full duplex unit allows simultaneous transmission in both directions. Many modems can operate in more than one mode (usually half and full duplex).

Speed of transmission is one of the more important factors to consider when purchasing a modem for your computer. If you plan to use the modem for linking into The Source or the CompuServe Information Service, the unit should transmit at up to 300 bps. This relatively slow speed is dictated by the quality of most dial-up phone lines. For business use (and a financial outlay of over $6000) you can pick up a synchronous modem that will send data at 64,000 bps over high quality leased lines. Luckily, individuals who wish only to tie into a network for their own private use can get a good machine in the $200 to $300 range.

Most modems on the market today are considered long-haul units; that is, they are capable of functioning satisfactorily over almost unlimited distances using regular dial-up telephone lines or leased lines. You can, however, obtain short-haul (or limited distance) models designed to function with short, point-to-point leased lines. The short-haul units generally cost less than long-haul versions with similar capabilities. As an end user, you'll probably want a long-haul model, though the short-haul units will be of interest to businesspersons whose firms have their own mini-networks for data processing. Definitions of what constitutes the "short" in short-haul vary so ask what the range of any particular short-haul unit is.

Originate/answer is another characteristic that the prospective modem buyer has to consider. While some modems feature only originate or only answer, the most flexible unit is one that has both capabilities. In most instances, at least when communicating with a time-sharing data base mainframe like The Source or CIS, you will be in the originate mode and the mainframe at the other end of the line will be in the answer mode. If you are going to buy a unit that has both originate and answer functions, be sure the mode can be changed with a switch setting rather than having to play around with the wires to go from one mode to the other.

Without going into a lot of detail, putting your modem into one of the two modes enables it to utilize certain frequencies to communicate with the modem down the line. For example: If you are in originate mode when you call the network mainframe, your modem will use a certain range of frequencies — call it "F" — to transmit. The range is due to needing one frequency of "F" to indicate a "1" and another frequency of "F" to denote a "0". In the originate mode, your modem will also use a range of frequencies "G" to receive data from the mainframe. The mainframe modem, which is set for answer, uses the "F" frequencies to receive your data while it sends data to you in the "G" range. If both modems were set to originate, they would both be transmitting in the "F" frequency range and receiving in the "G" range, which means no communication would take place at all.

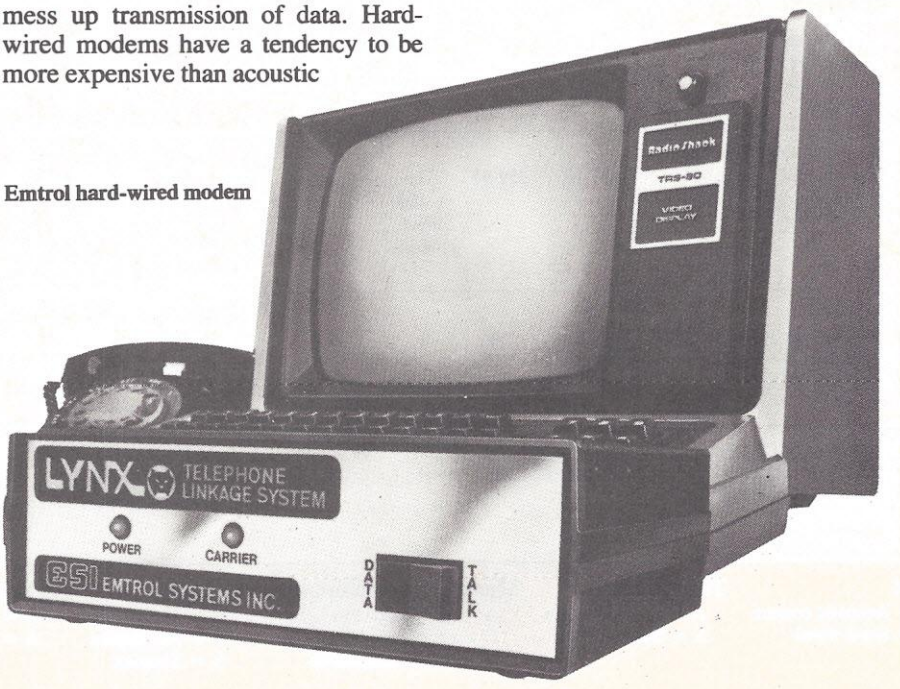
The final distinction among modems will be acoustic couplers versus hard-wired modems. In an acoustic coupler, a standard telephone receiver is placed in two rubber cups on the coupler. The coupler changes digital signals from the microcomputer into acoustical tones that are transmitted through the mouthpiece of the receiver. For reception, the coupler takes the tones emitted from the earpiece and changes them into digital signals. Hard-wired modems connect directly to your phone line by plugging into the phone's wall receptacle.

Each type of modem has advantages and disadvantages. An acoustic coupler is usually less expensive than a hard-wired unit and up to a short while ago was more portable as well. The major disadvantage of an acoustic unit is that background noise in the room can often mess up transmission of data. Hard-wired modems have a tendency to be more expensive than acoustic models and may be subject to phone company regulations. But, they don't suffer from the extraneous noise problem. Hardwired modems are constantly being redesigned and the newer models get smaller and more portable every day. Cost may be the major factor in deciding which type to purchase.

In addition to all the characteristics discussed, modems are being marketed with increasing capabilities and options. Some of the "extras" include automatic answering, automatic dialing, alternate voice/data transmission ability, equalization (a technique that compensates for transmission line inconsistencies), and diagnostic facilities (capabilities which allow the modem to test for transmit/receive problems before time is spent sending data over the lines). Remember, "extras" can raise the price of a unit considerably so be sure you're going to get full use of the "extra" before you spend a lot of money buying a unit.

A couple of final points to remember are to check on whether the modem you are interested in is compatible with the Bell modems; and, if it's a hard-wired model, whether the unit is FCC approved for direct connection to telephone lines.

Modems are an essential piece of equipment if you plan to use your microcomputer to communicate with other machines, whether micros or mainframes. They are surrounded with technical jargon but a person who knows what the terms mean and who has determined exactly what the unit will be used for will find the selection process easier to deal with. (Modem vendor guide on page 64.) □



Emtrol hard-wired modem

Modem Vendor Guide

Company Name	Model name or number	Price $	Type	Trans-mission	Modulation technique	Speed	Duplex	Operating mode	Distance	Bell compatible	FCC certified
Anderson Jacobson Inc. 521 Charcot Ave. San Jose, CA 95131 (408) 263-8520 *Circle 201*	A 242A	295	A	A	F	0-450 baud	H,F	O	L	Y	NA
	AJ 245	245	H	A	F	0-450 baud	F	O	L	Y	Y
Apple Computer Inc. 10260 Bandley Dr. Cupertino, CA 95104 (408) 996-1010 *Circle 202*	Micromodem II (for Apple II)	379	H	A	F	110 or 300 baud	S,H,F	O,A	L	Y	Y
Data Access Systems, Inc. 100 Route 46 Mountain Lakes, NJ 07046 (201) 227-8880 *Circle 204*	DASI 68-01	295	H	A	F	300 baud	H,F	O,A	L	Y	Y
Emtrol Systems Inc. 1262 Loop Rd. Lancaster, PA 17601 (717) 291-1116 *Circle 205*	Lynx (for TRS-80)	239.95	H	A	F	300 baud	H,F	O,A	L	Y	Y
Lexicon Corp. of Miami 8355 Executive Center Dr. Miami, FL 33166 (305) 592-4404 *Circle 206*	LEX-11	175	A	A	F	300 bps	H,F	O,A	L	Y	NA
Madzar Corp. 37490 Glenmoor Dr. Fremont, CA 94536 (415) 794-7400 *Circle 207*	Z9600	167	H	A	—	0-9600 bps	S,H,F	O,A	S (10 miles)	NA	NA
Micromint Inc. 917 Midway Woodmere, NY 11598 (516) 374-6793 *Circle 208*	Chatterbox	259.95	A	A	F	300 baud	F	O	L	Y	NA
MicroPeripheral Corp. PO Box 529 Mercer Is., WA 98040 (206) 454-3303 *Circle 209*	The Micro Connection (for TRS-80)	249	H	A	F	300 baud	H,F,S	O	L	Y	Y
Novation 18664 Oxnard St. Tarzana, CA 91356 (213) 996-5060 *Circle 210*	D-Cat	199	H	A	F	0-300 baud	H,F	O,A	L	Y	Y
	CAT	189	A	A	F	0-300 baud	H,F	O,A	L	Y	NA
Potomac Micro-Magic Inc. 3 Skyline Place, Suite 604 5201 Leesburg, VA 22041 (703) 379-9660 *Circle 211*	MM-103	359.95	H (S-100 direct plug-in)	A	F	61-600 baud	H,F	O,A	L	Y	Y
Radio Shack 1300 One Tandy Center Fort Worth, TX 76102 (817) 390-3011 *Circle212*	Telephone Interface II (for TRS-80)	199	A	A	F	0-300 baud	H,F	O,A	L	Y	NA
Universal Data Systems 5000 Bradford Dr. Huntsville, AL 35805 (205) 837-8100 *Circle 213*	UDS 103LP	195	H	A	F	0-300 bps	F	O	L	Y	Y

Type:
A = Acoustic coupler
H = Hard-wired

Transmission:
A = Asynchronous
S = Synchronous

Modulation technique:
A = Amplitude Modulation
F = Frequency Modulation
P = Phase Modulation

Duplex:
H = Half duplex
F = Full duplex
S = Simplex

Operating mode:
O = Originate
A = Answer

Distance:
L = Long haul
S = Short haul

Bell Compatible:
FCC Registered:
Y = Yes
NA = Not applicable

NEW YORK COLISEUM, OCTOBER 30 TO NOVEMBER 1, 1980

4th ANNUAL NATIONAL SMALL COMPUTER SHOW

A NEW WORLD OF SMALL COMPUTERS IS AT YOUR FINGERTIPS THIS FALL

When we say "fingertips" we mean just that: a hands-on-inspection opportunity for you to try the small computers and systems that will write the history of microprocessing in the 1980's.

Manufacturers will fill over 30,000 square feet with computers, software and peripherals. Amazing strides in technology are reflected in exhibits and lecture series.

New hardware and software for business, education, the sciences and professions, graphics and personal use are being gathered for the largest and most beautifully presented National Small Computer Show ever produced.

As always, the show contains attractions for the seasoned computer professional, as well as those who wish an introduction to the exciting world of small computers for business, professional or personal use. In just a short time, you can discuss your interest with many industry leaders, vendors, technologists, and our expert lecturers.

Registration fee is only $10 per day, and all registrants have free access to the hourly lectures.

LECTURE PROGRAM

A schedule of free lectures is available to all visitors. Lectures run about 50 minutes each, including, in most cases, some time for questions from the floor. Some topics are given twice, and, in some cases, topics of related interest are given on the same day for the visitor's convenience. (Program is subject to change without notice, but lectures will be posted daily in the show lobby.)

THURSDAY, OCTOBER 30

Noon Introduction to Small Systems for Business, Stan Veit, Associated Computer Industries
Noon Mailing Lists: Several Directions, Dr. Norman I. Agin, Mathtech, Inc.
1 p.m. Selecting a Small Computer for Business, David Benevy, Computer Mart of New Jersey
1 p.m. Evaluating and Improving Your Computer's Performance, Philip Grossman, Raytheon Co.
2 p.m. Law Office Systems Aspects of Word Processing, Bernard Sternin
2 p.m. Future Smart Machines: 2000 A.D. and Beyond, Dr. Earl Joseph, Sperry Univac
3 p.m. Computer Contracts—Facing the issues, Alan C. Verbit, Verbit and Company
3 p.m. Accounts Receivable/Accounts Payable/General Ledger
4 p.m. Using FORTRAN on a Microcomputer, Richard A. Zeitlin
4 p.m. Investment Analysis of Stocks and Commodities on a Microcomputer, Fred Cohen, Shearson Loeb Rhoades, Inc.

FRIDAY, OCTOBER 31

Noon Introduction to Small Systems for Business, Stan Veit, Associated Computer Industries
Noon BASIC Programming, Michael Mulcahey, Worcester Stage College
1 p.m. Selecting a Small Computer for Business, David Benevy, Computer Mart of New Jersey
1 p.m. Videoprints: Full-Color, Low-Cost, Hard-Copy Computer Graphics, Warren Sullivan, Image Resource Corp.
2 p.m. Mailing Lists: Several Directions, Dr. Norman I. Agin, Mathtech, Inc.
2 p.m. Business Applications Software Development via Data Base Management, Dr. Andrew Whinston, Micro Data Base Systems
3 p.m. Application of PASCAL to Small Systems for Business, Panel, Stan Veit, Moderator, Associated Computer Systems
3 p.m. Investment Analysis of Stocks and Commodities on a Microcomputer, Fred Cohen, Shearson Loeb Rhoades, Inc.
4 p.m. Advantages of Distributed Processing and Multi-Processing, John Steefel, Q1 Corp.
4 p.m. To be assigned.

SATURDAY, NOVEMBER 1

Noon Educational Software: The Good, the Bad, the Ugly. Jo Ann Comito, S.U.N.Y. at Stony Brook
Noon Introduction to Personal Computing, RCA—Solid State
1 p.m. Computer-Assisted Mathematics Courses, Dr. Frank Scalzo, Queensborough Community College
2 p.m. Artificial Intelligence Update, Prof. Peter Kugel, Boston College
2 p.m. Compiling and Retrieving Personal Medical Data, Dr. Derek Enlander, St. Luke's Hospital
2 p.m. The Present State of CP/M Compatible Software, Tony Gold, Lifeboat Associates
3 p.m. High Volume Data Handling: An Introduction to File Processing, Prof. Peter Kugel, Boston College
3 p.m. Connecting the Computer to the Outside World, Prof. James Gips, Boston College
4 p.m. Educational Applications in the Home, David Ahl, "Creative Computing Magazine"
4 p.m. Household Applications—Some New, Dr. Dennis J. McGuire

SPECIAL SESSION: EXECUTIVE EDUCATION CONFERENCE FOR BUSY PEOPLE

This year, NSCS will present a special five-hour conference formulated as an intensive fast education for administrators and executives. The aim is to show the conferee how to cope with computers in business. No prior knowledge of computers is needed. The session will proceed on a step-by-step basis, covering computers, computer jargon, software systems, and peripherals. It will indicate how to assess computer requirements, how to talk to vendors, and how to make a system work efficiently, after you've bought it wisely.

An executive education session will be given daily for four days, Oct. 29 through Nov. 1, in the New York Coliseum. Each session is limited in attendance, and reservation must be made. Registration is on a first-come, first-served basis. Fee is $200, and includes three-day admission to the National Small Computer Show, coffee break, and workbook materials. Please write or call the show office for session outline and registration form. (Do not use registration form in this ad for special session.

NATIONAL SMALL COMPUTER SHOW
110 Charlotte Place
Englewood Cliffs, N.J. 07632 (201) 569-8542

REGISTRATION FOR AMERICA'S BIGGEST SMALL COMPUTER SHOW

Please register me for the 4th Annual National Small Computer Show, Oct. 30 - Nov. 1, 1980 New York Coliseum.

NAME _____ BUSINESS TITLE (If Any)_____

COMPANY (If Any)_____ TELEPHONE_____

ADDRESS _____ ZIP _____

Your company's primary business. Check one.

1 ☐ Accounting firm
2 ☐ Advertising/Marketing
3 ☐ Banking/Insurance/Real Estate/Credit/Securities
4 ☐ Communications
5 ☐ Computer Consultant
6 ☐ Computer Dealer/Dist.
7 ☐ Construction/Architecture
8 ☐ Education
9 ☐ Engineering
10 ☐ Entertainment/News
11 ☐ Government/Military
12 ☐ Hospital
13 ☐ Hotel
14 ☐ Industrial Design
15 ☐ Law Office
16 ☐ Management Consultant
17 ☐ Manufacturing
18 ☐ Personnel Agency
19 ☐ Professional Services
20 ☐ Research/Development
21 ☐ Transportation (All)
22 ☐ Utility
23 ☐ Wholesale/Retail Sales
24 ☐ Other (Please Specify) _____

Check your primary job function.

1 ☐ Account Executive
2 ☐ Administrator
3 ☐ Bookkeeper
4 ☐ Chemist/Pharm.
5 ☐ Consultant
6 ☐ Corporate Officer
7 ☐ C.P.A.
8 ☐ Creative Arts (All)
9 ☐ Designer (All)
10 ☐ DP/WP Manager/Operator
11 ☐ Doctor
12 ☐ Engineer (All)
13 ☐ Lawyer
14 ☐ Office Manager
15 ☐ Programmer
16 ☐ Purchasing
17 ☐ Salesperson (All)
18 ☐ Scientist
19 ☐ Skilled Laborer
20 ☐ Student
21 ☐ Teacher
22 ☐ Technician
23 ☐ Other (Please Specify) _____

Your primary interest in computers (check only one) 1 ☐ Business 2 ☐ Personal 3 ☐ Both

☐ ONE DAY $10 ☐ TWO DAYS $20
☐ THREE DAYS $30

Mail with payment of $10 for each day you wish to attend. Use one form per person. Registration badge will be sent by mail in early October. Check or money order only.

Mail prior to October 10, 1980.
Foreign orders: October 1, 1980.
National Small Computer Show
110 Charlotte Place
Englewood Cliffs, NJ 07632
201-569-8542

A Traveler's Restaurant Guide

BY G. R. BOYNTON

I am a traveler — at least in a limited sense. I go to professional meetings between six and ten times a year. And one of the pleasures of this travel is being able to eat in interesting restaurants.

For a number of years I've thought it would be nice to keep a list of restaurants in which I have eaten in order to reduce the uncertainty when I return to a city two or three years later. But that would mean a filing system I've never felt up to creating and maintaining.

Enter the Pet! What is a computer if not an information system? The result is this program which lets me keep track of where I've eaten and find out what I thought of the restaurants before taking off for that city again.

"A Traveler's Restaurant Guide" is built on the assumption that you want to keep track of a limited number of restaurants in a number of different cities. That assumption provides the basic structure of the program. This program would not be useful for a person in a metropolitan area who wanted to keep track of many restaurants in that city. But I believe there are many people who share my traveling habits.

The program operates on a series of questions and user responses, so it's a rather simple program to use.

After loading the program you're asked if the data tape is ready or if a new tape is being started. The information about restaurants is stored on a tape which must be read every time the program is used unless a new tape is being started.

Once the data tape is read or you answer "NEW", you are asked if you want to INPUT, EDIT or SEARCH. Those are the three functions performed by the program. These are separate modules in the program which

Mr. Boynton is a Professor and Chairman of the Department of Political Science at the University of Iowa.

Program Listing

```
100 PRINT"[CLR][DN][DN][DN]"TAB(4);"A TRAVELER'S RESTAURANT GUIDE"
110 PRINT"[DN][DN][DN]THIS PROGRAM IS FOR STORING AND"
120 PRINT"RETRIEVING INFORMATION ON RESTAURANTS."
130 PRINT"[DN]THE INFORMATION IS STORED ON A DATA"
140 PRINT"TAPE, AND YOU CAN SEARCH FOR THE REST-"
150 PRINT"AURANTS IN THE CITY OF YOUR CHOICE."
199 GOSUB 10000
200 DIM I$(50),NA$(50),AD$(50),FD$(50),CH$(50)
210 PRINT"[CLR][DN][DN][DN]FIRST THE DATA TAPE MUST BE READ UNLESS"
220 PRINT"YOU ARE GOING TO START A NEW TAPE."
230 PRINT"[DN][DN]IS THE DATA TAPE IN TAPE#1 AND REWOUND?"
240 PRINTTAB(3)"[DN]YES"
250 PRINTTAB(3)"NO"
260 PRINTTAB(3)"NEW DATA TAPE"
270 PRINT"[DN][DN]":INPUT A$
280 IF A$="NO" GOTO 210
290 IF A$="YES" THEN GOSUB 10100
300 PRINT"[CLR][DN][DN][DN]WOULD YOU LIKE TO:"
310 PRINTTAB(3)"[DN]INPUT"
320 PRINTTAB(3)"EDIT"
330 PRINTTAB(3)"SEARCH"
340 PRINTTAB(3)"QUIT"
350 PRINT"[DN][DN]":INPUT A$
360 IF A$="INPUT" THEN RO=1
370 IF A$="EDIT" THEN RO=2
380 IF A$="SEARCH" THEN RO=3
390 IF A$="QUIT" THEN GOTO 500
400 ON RO GOSUB 1000,2000,3000
410 GOTO 300
500 IF CG=0 THEN GOTO 600
510 PRINT"[CLR][DN][DN][DN]YOU HAVE MADE ONE OR MORE CHANGES TO"
520 PRINT"THE INFORMATION.  DO YOU WANT TO COPY"
530 PRINT"TO THE TAPE?"
540 INPUT"[DN]";A$
550 IF A$="NO" THEN GOTO 600
560 GOSUB 11200
600 PRINT"[CLR][DN][DN][DN]HAPPY EATING!":END
899 END
900 PRINT"[CLR][DN][DN]THE ROUTINES CONTAINED IN THE PROGRAM"
902 PRINT"[DN]1. INTRODUCTION: 100-199"
904 PRINT"[DN]2. READ DATA TAPE?: 200-299"
906 PRINT"[DN]3. ROUTE TO 3 MODULES: 300-399"
908 PRINT"[DN]4. INPUT NEW DATA: 1000-1999"
910 PRINT"[DN]5. EDIT FILE: 2000-2999"
912 PRINT"[DN]6. SEARCH MODULE: ROUTE (3000-3100);
914 PRINT"   SEARCH CITY (3300-3599); PRINT ALL      (3600-3699)"
916 PRINT"[DN]7. GOODBYE & SEND TO WRITE TAPE: 500-600
958 GOSUB 10000
960 PRINT"[CLR][DN][DN]UTILITY SUBROUTINES"
962 PRINT"[DN]1. SPACE BAR TO CONTINUE: 10000-10020"
964 PRINT"[DN]2. READ DATA TAPE: 10100-10160"
966 PRINT"[DN]3. LIST REGIONS: 10300-10399"
968 PRINT"[DN]4. LIST CITIES IN:"
970 PRINT"   EAST: 10500-10599"
972 PRINT"   SOUTH: 10600-10699"
974 PRINT"   MIDWEST: 10700-10799"
976 PRINT"   SOUTHWEST: 10800-10899"
978 PRINT"   WEST: 10900-10999"
980 PRINT"[DN]5. DEFINE RO FOR REGIONS: 11000-11099"
```

```
982 PRINT"[DN]6. WRITE TO TAPE: 11200-11300"
995 GOSUB 10000
999 END
1000 PRINT"[CLR][DN][DN][DN]YOU WILL ADD RESTAURANTS TO THE FILE"
1010 PRINT"BY ANSWERING A SERIES OF QUESTIONS."
1020 PRINT"[DN][DN]IN WHICH REGION OF THE COUNTRY IS THE"
1030 PRINT"RESTAURANT LOCATED?"
1040 GOSUB 10300
1050 INPUT"[DN][DN]";I1$
1060 LET X$=I1$
1070 GOSUB 11000
1100 PRINT"[CLR][DN][DN]IN WHAT CITY IS THE RESTAURANT LOCATED?"
1110 ON RO GOSUB 10500,10600,10700,10800,10900
1120 PRINT"[DN][DN]":INPUT I2$
1130 LET N=N+1
1140 LET I$(N)=I1$+I2$
1200 PRINT"[CLR][DN][DN][DN]WHAT IS THE NAME OF THE RESTAURANT?"
1210 INPUT "[DN]";NA$(N)
1250 PRINT"[DN][DN]WHAT IS THE STREET ADDRESS?"
1260 INPUT "[DN]";AD$(N)
1300 PRINT"[DN][DN]WHAT IS THE ETHNIC ORIENTATION OR"
1310 PRINT"STYLE OF CUISINE?"
1320 INPUT "[DN]";FD$(N)
1350 PRINT"[DN][DN]HOW WOULD YOU CHARACTERIZE IT?"
1360 INPUT "[DN]";CH$(N)
1990 CG=CG+1
1999 RETURN
2000 PRINT"[CLR][DN][DN][DN]WHAT IS THE NAME OF THE RESTAURANT?"
2010 INPUT"[DN]";RE$
2020 PRINT"[DN][DN]DO YOU WISH TO EDIT:"
2030 PRINTTAB(3)"[DN]NAME"
2040 PRINTTAB(3)"ADDRESS"
2050 PRINTTAB(3)"ETHNIC OR CUISINE"
2060 PRINTTAB(3)"CHARACTERIZATION"
2070 INPUT"[DN]";A$
2080 IF A$="NAME" THEN RO=1
2090 IF A$="ADDRESS" THEN RO=2
2100 IF A$="ETHNIC" THEN RO=3
2110 IF A$="CHARACTERIZATION"THEN RO=4
2120 FOR J=1 TO N
2130 IF RE$=NA$(J) THEN ON RO GOSUB 2200,2250,2300,2350
2140 NEXT J
2150 PRINT"[CLR][DN][DN][DN]WOULD YOU LIKE TO EDIT SOMETHING ELSE"
2160 PRINT"ABOUT THIS RESTAURANT?"
2170 INPUT"[DN]";A$
2180 IF A$="YES" THEN GOTO 2020
2185 CG=CG+1
2190 RETURN
2200 PRINT"[CLR][DN][DN][DN]WHAT IS THE NEW NAME OF THE RESTAURANT?"
2210 INPUT"[DN]";NA$(J)
2220 RETURN
2250 PRINT"[CLR][DN][DN][DN]WHAT IS THE NEW STREET ADDRESS?"
2260 INPUT"[DN]";AD$(J)
2270 RETURN
2300 PRINT"[CLR][DN][DN][DN]WHAT IS THE NEW ETHNIC OR CUISINE?"
2310 INPUT"[DN]";FD$(J)
2320 RETURN
2350 PRINT"[CLR][DN][DN][DN]WHAT IS THE NEW CHARACTERIZATION?"
2360 INPUT"[DN]";CH$(J)
2370 RETURN
2999 RETURN
3000 PRINT"[CLR][DN][DN][DN]YOU CAN EITHER GET THE RESTAURANTS"
3010 PRINT"LOCATED IN A SPECIFIC CITY OR CAN GET"
3020 PRINT"THE INFORMATION ON ALL THE RESTAURANTS"
3030 PRINT"THE DATA FILE."
3040 PRINT"[DN][DN]WOULD YOU LIKE:"
3050 PRINTTAB(3)"[DN]CITY"
3060 PRINTTAB(3)"ALL"
3070 INPUT "[DN]";A$
3080 IF A$="CITY" THEN RO=1
3090 IF A$="ALL" THEN RO=2
3100 ON RO GOSUB 3300,3600
3110 PRINT"[CLR][DN][DN][DN]WOULD YOU LIKE TO SEARCH AGAIN?"
3120 INPUT "[DN]";A$
3130 IF A$="YES" THEN  3000
3140 RETURN
3300 PRINT"[CLR][DN][DN][DN]IN WHICH REGION IS THE RESTAURANT"
3310 PRINT"LOCATED?"
3320 GOSUB 10300
3330 INPUT "[DN]";S1$
3335 LET X$=S1$
3340 GOSUB 11000
```

continued

are accessed as subroutines. Choose one, and off you go to that module. After finishing one of the modules the program always returns to this question or branching point.

The INPUT module first asks for the region of the country in which the restaurant is located. The program divides the country into five regions, and you choose one of the five. Then you're asked for the city in which the restaurant is located. Again, cities are listed on the screen and you make a choice. Finally, four pieces of information about the restaurant are requested: the name, street address, ethnic origin or style of cuisine, and a characterization of the restaurant (which can be anything you choose to save).

The EDIT routine assumes you know the name of the restaurant, and begins by asking for the name. Then it asks if you want to change: the name, the address, the ethnic or cuisine style, or the characterization. If you choose NAME then you can type in a new name. And it works the same way for each of the others. The program replaces the information in memory with what you type. While only one change may be made at a time, you always go back to the question so as many of the four pieces of information about a restaurant can be changed as desired.

The final module is the SEARCH routine. You can either print all of the items in the data base on the screen, or you can find the restaurants located in a

Program Routines

Introduction: 100-199
Read Data Tape?: 200-299
Route to 3 Modules: 300-399
Input New Data: 1000-1999
Edit File: 2000-2999
Search Module: Route (3000-3100);
Search City (3300-3599);
Print All (3600- 3699)
Goodbye & Send to Write Tape: 500-600

Utility Subroutines

Space Bar to Continue: 10000-10020
Read Data Tape: 10100-10160
List Regions: 10300-10399
List Cities In:
- East: 10500-10599
- South: 10600-10699
- Midwest: 10700-10799
- Southwest: 10800-10899
- West: 10900-10999

Define Ro for Regions: 11000-11099
Write to Tape: 11200-11300

single city. To find the restaurants in a specific city you answer "city." The program asks for the region of the country, then the city. Once the city is specified, the program displays all of the restaurants from that city in the data base.

"Restaurant Guide" keeps track of changes made in the data during its operation. If a restaurant was added or editing performed, the program notes this. When you say QUIT it will tell you that changes have been made and ask if you want to write the changes on the data tape. To rewrite the data tape, make sure it is rewound and in tape #1.

The program is very simple. It lets you input and edit information on restaurants. Then it will print this information for the city you select. Obviously, the program could be written to do more than this, but with personal computers come personal programs. And this does what a traveling person needs done.

The program is written in Pet Basic. Documentation is included in a rather unusual manner. Instead of many REMark statements scattered throughout the program, the equivalent of such remarks are collected in lines 900 through 999. If you type RUN 900 it will first tell you the line location of all of the major segments of the program. Then it will give the line location of all of the major subroutines. You can find any major part of the program by simply typing RUN 900. I find this procedure very handy in both writing programs and in revising them months later. It is rather like a table of contents to the program.

The program is designed as a series of branching points and subroutines. In these subroutines are other subroutines used for operations in several parts of the program. There is a considerable amount of English text built into the program, but this structure reduces the RAM used. With the documentation (lines 900 to 999) the program requires 5043 bytes of RAM. Without documentation, only 4222 bytes are required.

There's one feature of the program that you may want to change. My cities may not be your cities. I have included 2 or 3 for each region. The names of the cities are included in subroutines in the program, one subroutine for each region. The location of each subroutine is given in the documentation (lines 900 to 999). It is a straightforward matter to add and subtract cities.

As the program concludes: GOOD EATING. □

```
 3350 PRINT"[CLR][DN][DN]IN WHAT CITY IS THE RESTAURANT LOCATED?"
 3360 ON RO GOSUB 10500,10600,10700,10800,10900
 3370 INPUT "[DN]";S2$
 3380 LET SE$=S1$+S2$
 3390 CO=0
 3395 PRINT"[CLR]"
 3400 FOR K=1 TO N
 3410 IF SE$=I$(K) THEN GOSUB 3500
 3420 NEXT K
 3430 IF CO=0 THEN PRINT"NO RESTAURANTS HAVE BEEN FOUND FOR THAT
      CITY."
 3450 GOSUB 10000
 3460 RETURN
 3500 CO=CO+1
 3510 PRINT"[DN]"; NA$(K)
 3520 PRINT AD$(K)
 3530 PRINT FD$(K)
 3540 PRINT CH$(K)
 3550 IF INT(CO/3)=(CO/3) THEN GOSUB 10000
 3560 IF INT(CO/3)=(CO/3) THEN PRINT "[CLR]"
 3570 RETURN
 3600 PRINT"[CLR]"
 3610 FOR J=1 TO N
 3620 PRINT"[DN]" NA$(J):PRINT AD$(J):PRINT FD$(J):PRINT CH$(J)
 3630 IF INT(J/3)=(J/3) THEN GOSUB 10000
 3640 IF INT(J/3)=(J/3) THEN PRINT "[CLR]"
 3650 NEXT J
 3660 GOSUB 10000
 3670 RETURN
10000 PRINT"[HM]"
10010 FOR DN=1 TO 20
10020 PRINT"[DN]";
10030 NEXT DN
10040 PRINT"PRESS THE SPACE BAR TO CONTINUE"
10050 GET SP$:IF SP$="" THEN 10050
10060 RETURN
10100 OPEN 1
10110 INPUT#1,N
10120 FOR K=1 TO N
10130 INPUT#1,I$(K),NA$(K),AD$(K),FD$(K),CH$(K)
10140 NEXT K
10150 CLOSE 1
10160 RETURN
10300 PRINTTAB(3)"[DN]EAST"
10310 PRINTTAB(3)"SOUTH"
10320 PRINTTAB(3)"MIDWEST"
10330 PRINTTAB(3)"SOUTHWEST"
10340 PRINTTAB(3)"WEST"
10350 RETURN
10500 PRINTTAB(3)"[DN]BOSTON"
10510 PRINTTAB(3)"NEW YORK"
10599 RETURN
10600 PRINTTAB(3)"[DN]ATLANTA"
10610 PRINTTAB(3)"NEW ORLEANS"
10620 PRINTTAB(3)"WASHINGTON"
10699 RETURN
10700 PRINTTAB(3)"[DN]CHICAGO"
10710 PRINTTAB(3)"MINNEAPOLIS"
10720 PRINTTAB(3)"ST. LOUIS"
10799 RETURN
10800 PRINTTAB(3)"[DN]HOUSTON"
10810 PRINTTAB(3)"SAN ANTONIO"
10899 RETURN
10900 PRINTTAB(3)"[DN]LOS ANGELOS"
10910 PRINTTAB(3)"SAN FRANCISCO"
10999 RETURN
11000 IF X$="EAST" THEN RO=1
11010 IF X$="SOUTH" THEN RO=2
11020 IF X$="MIDWEST" THEN RO=3
11030 IF X$="SOUTHWEST" THEN RO=4
11040 IF X$="WEST" THEN RO=5
11050 RETURN
11200 OPEN 1,1,1
11210 PRINT#1,N
11220 FOR K=1 TO N
11230 PRINT#1, I$(K)
11240 PRINT#1,NA$(K)
11250 PRINT#1,AD$(K)
11260 PRINT#1,FD$(K)
11270 PRINT#1,CH$(K)
11280 NEXT K
11290 CLOSE 1,1,1
11300 RETURN
READY.
```

Definitions of Translations

[CLR]	CLEAR SCREEN
[DN]	CURSOR DOWN
[UP]	CURSOR UP
[HM]	CURSOR HOME
[LC]	CURSOR LEFT
[RC]	CURSOR RIGHT
[RV]	REVERSE
[RVOFF]	REVERSE OFF

Sample Run

```
A TRAVELER'S RESTAURANT GUIDE

THIS PROGRAM IS FOR STORING AND
RETRIEVING INFORMATION ON RESTAURANTS.
THE INFORMATION IS STORED ON A DATA
TAPE, AND YOU CAN SEARCH FOR THE REST-
AURANTS IN THE CITY OF YOUR CHOICE.

FIRST THE DATA TAPE MUST BE READ UNLESS
YOU ARE GOING TO START A NEW TAPE.
IS THE DATA TAPE IN TAPE#1 AND REWOUND?

YES
NO
NEW DATA TAPE

YES

WOULD YOU LIKE TO:
INPUT
EDIT
SEARCH
QUIT

SEARCH

YOU CAN EITHER GET THE RESTAURANTS
LOCATED IN A SPECIFIC CITY OR CAN GET
THE INFORMATION ON ALL THE RESTAURANTS
THE DATA FILE.

WOULD YOU LIKE:
CITY
ALL

CITY

IN WHICH REGION IS THE RESTAURANT
LOCATED?
EAST
SOUTH
MIDWEST
SOUTHWEST
WEST

WEST

IN WHAT CITY IS THE RESTAURANT LOCATED?
LOS ANGELOS
SAN FRANCISCO

SAN FRANCISCO

RUE LEPIC
900 PINE STREET
CONTINENTAL
SMALL AND QUIET WITH EXCELLENT FOOD AT
MODERATE PRICES;RESERVATIONS NEEDED

NORTH BEACH RESTAURANT
1512 STOCKTON STREET
ITALIAN
TENDS TOWARD ELEGANT WITH EXCELLENT FOOD
AT HIGH PRICES;RESERVATIONS NEEDED

CASABLANCA
OUTER EDGE OF CENTRAL CITY
ITALIAN
MEDIUM SIZE;I LOVED THE VEAL AND DESERT
;MODERATE PRICE
```

Extended Basic for Your TRS-80

BY WILLIAM F. STOCKWELL

This disk-based Basic program augments Level II/Disk Basic on the TRS-80. Essentially, the program allows you to input lines of enhanced Basic source code and then translates the code into Level II Basic. You may save the resulting Level II program on disk for normal usage. (Note: When I say Level II, I'm referring to TRS-80 Disk Basic). You should have 48K of RAM to use this program because, although the program itself is only about 12K, it eats huge amounts of string space and array space. It wouldn't be difficult to alter the program to run on a 32K system, however.

The enhancements to Basic include statements for matrix/vector manipulations, DO WHILE and DO UNTIL statements, a more powerful instring function called SUBSTR, and the ability to create useful subroutines.

I am not very familiar with the Basics used on other microcomputers but from what I have seen, you could easily adapt the ideas used in this programs to other systems.

When you run this program (called "Extend"), here's what happens: First, it prompts you to enter the file name of the program you wish to write. After this, you are in the Extended Basic monitor mode as indicated by the LINE INPUT prompt — the cursor. At this point, the computer is waiting for one of two things: either a line of source code (a programming statement) or a system command. The machine distinguishes between the two by the presence (or absence) of a line number.

System commands are RUN, NEW, LIST, LLIST and a few others, notably TRAN (translate into Level II).

Usually, you input program lines (with line numbers) and, when you have entered the whole program, type in the system command TRAN. Your program is now translated into Level II Basic, and you are returned to the Monitor mode, presumably to issue the System command RUN (or possibly SAVE).

RUN will save your program on disk (under the file name you gave it at the beginning) and proceed to run it — wiping Extend from memory in the process, of course. SAVE simply saves your program without RUNning it. LIST and LLIST work as usual, while NEW lets you start all over (it simply re-runs the Extend program). Another command, LOAD, will load the file whose filename you issued at the beginning from disk. It should be a file created by the Extend program.

Any time you need a list of available system commands, type COM (Enter).

Editing of your programs is rather limited. You can enter the lines of your program out of sequence and they will be properly ordered. If you wish to replace a line, retype it. To delete a line, you must use the System command DEL. For example, DEL 20 would delete line 20. You can only delete one line at a time.

Errors in your program will be detected during the translation process, which is halted as soon as the first error is found. Extend has error reporting and will usually indicate the type of error and the line in which the error occurred.

It's important to understand the translation process. The translator scans the source code a line at a time, using the INSTR function to locate keywords. If a REM is found, the line is ignored; if no enhanced Basic keywords are found, Extend assumes the line is a standard Basic statement and goes on to the next line.

If an enhanced Basic keyword is found, Extend inserts "REM" into the line (otherwise a SYNTAX ERROR would occur when you try to run the program!) and then inserts the appropriate translated line immediately afterwards. For this reason, you shouldn't use consecutive line numbers in your program.

Some enhancements can't be simulated by inserting a single line. When this happens, an entire subroutine is inserted (starting with line numbers no lower than 29000). You may wish to include an END statement at the end of your original source code so the program won't accidentally crash into a subroutine.

It's also a good idea to define variables I through N to be integers in your enhanced Basic programs as this speeds up execution since the translator assumes these to be integers and uses

Figure 1 SIMULTANEOUS EQUATIONS -- EXTEND VERSION

```
10 CLS:DEFINT I-N:?"                    *** SIMULTANEOUS LINEAR EQUATIO
NS ***":?
20 INPUT"ENTER THE NUMBER OF EQUATIONS";NN
30 N1=NN:N2=NN:N3=NN
40 PRINT"ENTER THE COEFFICIENTS, ONE AT A TIME, BY ROWS :"
50 MAT INPUT B
60 DIM C(NN,1)
70 N2=1
80 PRINT"NOW ENTER THE RIGHT HAND SIDE COEFFICIENTS, ONE AT A TIME
:"
90 MAT INPUT C
100 REM  WE NOW SOLVE THE MATRIX-VECTOR EQUATION B*X=C, FOR X
110 MAT A=INV(B)
120 N2=NN:N3=1 'SO WE CAN MULTIPLY A BY C
130 DIM X(NN,1)
140 MAT X=A*C
150 CLS
160 PRINT"SOLUTION :"
165 N2=1
170 MAT PRINT X
180 END
```

them as such. Actually, it restricts itself to variable names starting with K and N, for the most part.

In general, only one enhanced Basic statement may appear on any one line and it must appear alone. For example, you couldn't say:

10 N1 = 1: MAT INPUT A

It would have to be:

5 N1 = 1
10 MAT INPUT A

Multi-statement lines are acceptable, but only if all the statements are standard Basic.

Do *not* use enhanced Basic keywords anywhere in your program except in the actual programming statements! For example, you can't say

10 PRINT "ENTER THE MATRIX"

since "MAT" is a keyword even though it is between quotes. This problem tends to crop up a lot, so be careful.

Now for the actual enhancements. Most of the usual Matrix statements are here. They are:

MAT INPUT array name
MAT PRINT name
MAT name$_1$ = name$_2$
MAT name = ZER [*Zero out a matrix*]
MAT name = IDN [*Set matrix = identity*]
MAT name$_1$ = TRN (name$_2$) [*transpose*]
MAT A = INV (B) [*matrix inverse*]
MAT name$_1$ = name$_2$ + name$_3$ [*matrix addition*]
MAT name$_1$ = − name$_2$ [*e.g., A = − B*]
MAT name$_1$ = name$_2$ * name$_3$ [*multiplication*]

On matrix inverse, you must use the array names A and B; that is, you must invert matrix B and set matrix A equal to the inverse.

The Extend translator uses the variable names N1, N2, N3 and NN when dealing with matrices, and you must use them also. When inputting or printing a matrix, N1 equals the number of rows and N2 equals the number of columns. In general your matrix is considered to be N1 by N2, and you have to set up the size of your matrices in your program, using these same variable names. Thus, to input a 3 × 3 matrix:

10 N1 = 3 : N2 = 3
20 MAT INPUT A

For most purposes, this is all you need. To do matrix multiplication, the first factor is assumed to be N1 by N2, the second N2 by N3. Also, to do a matrix inverse or determinant, set NN equal to the order of the (necessarily square) matrix. There is a built-in determinant function:

S = DET (A)

[*where A is an NN by NN matrix*]

Of course, you can use any variable name instead of S.

Extend does not allow arbitrary use of built-in functions. For example, you can't say PRINT DET (A) or A = A + DET (Z); functions can only be used in simple assignment statements. When using DET, you need to DIMension the array DT as NN by NN (NN = order of your matrix) if this order exceeds 10.

Other built-in functions allow vector dot and cross products. Vectors should be dimensioned as N1 by 1 for dot and cross products (so as to be compatible with matrix multiplication). Syntax is:

DOT S = <A,B>

which sets S (or whatever variable name) equal to the dot product of vectors A and B. For the cross product,

VEC A = B * C

sets vector A to B times C (cross product).

For single dimension vectors, there

Figure 2 SIMULTANEOUS EQUATIONS -- AFTER TRANSLATION

```
10 CLS:DEFINT I-N:?"                              *** SIMULTANEOUS LINEAR EQUATIO
NS ***":?
20 INPUT"ENTER THE NUMBER OF EQUATIONS";NN
30 N1=NN:N2=NN:N3=NN
40 PRINT"ENTER THE COEFFICIENTS, ONE AT A TIME, BY ROWS :"
50 REM MAT INPUT B
51 FORK1=1TON1:FORK2=1TON2:INPUTB(K1,K2):NEXTK2,K1
60 DIM C(NN,1)
70 N2=1
80 PRINT"NOW ENTER THE RIGHT HAND SIDE COEFFICIENTS, ONE AT A TIME
:"
90 REM MAT INPUT C
91 FORK1=1TON1:FORK2=1TON2:INPUTC(K1,K2):NEXTK2,K1
100 REM   WE NOW SOLVE THE MATRIX-VECTOR EQUATION B*X=C, FOR X
110 REM MAT A=INV(B)
111 GOSUB 30000
120 N2=NN:N3=1 'SO WE CAN MULTIPLY A BY C
130 DIM X(NN,1)
140 REM MAT X=A*C
141 FORK1=1TON1:FORK2=1TON3:X(K1,K2)=0:FORK3=1TON2:X(K1,K2)=X(K1,K
2)+A(K1,K3)*C(K3,K2):NEXTK3,K2,K1
150 CLS
160 PRINT"SOLUTION :"
165 N2=1
170 REM MAT PRINT X
171 FORK1=1TON1:?:FORK2=1TON2:PRINTX(K1,K2);:NEXTK2,K1
180 END
30000 FORK1=1TONN:FORK2=1TONN:A(K1,K2)=-(K1=K2):NEXTK2,K1
30010 FORKI=1TONN-1
30020 KC=1
30030 IFB(KI,KI)<>0THEN30070
30040 IFKI+KC>NNTHENPRINTCHR$(78);CHR$(79);CHR$(32);ChR$(73);cHr$(
78);ChR$(86);cHr$(69);ChR$(82);cHr$(83);ChR$(69):STOP
30050 I1=1:I2=KI+KC:KC=KC+1:GOSUB30210
30060 GOTO30030
30070 I1=KI:XK=1/B(KI,KI):GOSUB30190
30080 FORKJ=KI+1TONN
30090 XK=-B(KJ,KI):I2=KJ:GOSUB30200
30100 NEXTKJ,KI
30110 IFB(NN,NN)=0THENPRINTCHR$(78);CHR$(79);CHR$(32);CHR$(73);CHR
$(78);CHR$(86);CHR$(69);CHR$(82);CHR$(83);CHR$(69):STOP
30120 XK=1/B(NN,NN):I1=NN:GOSUB30190
30130 FORKI=NNTO2STEP-1
30140 I1=KI
30150 FORKJ=KI-1TO1STEP-1
30160 XK=-B(KJ,KI):I2=KJ:GOSUB30200
30170 NEXTKJ,KI
30180 RETURN
30190 FORKK=1TONN:A(I1,KK)=XK*A(I1,KK):B(I1,KK)=XK*B(I1,KK):NEXT:R
ETURN
30200 FORKK=1TONN:A(I2,KK)=A(I2,KK)+XK*A(I1,KK):B(I2,KK)=B(I2,KK)+
XK*B(I1,KK):NEXT:RETURN
30210 FORKK=1TONN:CC=A(I1,KK):A(I1,KK)=A(I2,KK):A(I2,KK)=CC:CC=B(I
1,KK):B(I1,KK)=B(I2,KK):B(I2,KK)=CC:NEXT:RETURN
```

are two functions available. The statement:

S = SUM X, 1, N

sets S equal to X(1) + X(2) + . . . + X(N), and you may start and end the sum anywhere, using variables or constants. There is nothing special about the array X — any variable name may be used. Only the matrix inverse routine requires specific variable names.

You can also multiply array elements together in a similar way:

P = PRD A, 1, N

so that P = A(1) * A(2) * . . . * A(N).

For those who like structured programming, there are the DO WHILE and DO UNTIL statements. For example:

```
10 I = 1
20 DO WHILE I < 10
30 S = S + I
40 I = I + 1
50 END WHILE
```

This program (when translated and run) would set S equal to 1 + 2 + 3 + . . . + 9. DO UNTIL works similarly. These loops may be nested. The condition following DO WHILE or DO UNTIL may be any logical expression, for example, DO UNTIL A$ = " " or DO WHILE NOT EOF(1).

The INSTR function of Disk Basic is nice but only finds the first occurrence of a substring within a larger string. The SUBSTR function of Extend finds *all* occurrences. The information is recorded in array KK as follows:

KK(0) = the number of occurrences,
KK(1) = the position of the first occurrence,
KK(2) = the position of the second occurrence, etc.

For example, suppose A$ = "YESNOYESYES" and B$ = "YES". Then the statement SUBSTR A$, B$ would cause KK(0) to equal 3 (3 occurrences of "YES" within A$), KK(1) = 1 (first "YES" starts at position 1), KK(2) = 6, KK(3) = 9.

The final enhancement of Extend is potentially the most powerful. The function allows you to create and call a new kind of subroutine which I call a "procedure," as in PL/1. The nice thing about "procedure" is that it can call itself, allowing you to do recursive programming. For example, a procedure called POWER could compute X ↑ Y and would appear as:

```
POWER:PROC (X,Y)
Z = X ↑ Y
END POWER
```

Note that any parameters you wish to pass are contained in a list following the keyword PROC. Parameters are not required, however, and you can pass any variable names to the procedure not just the ones used in the procedure. For example,

CALL POWER (A,B)

would set Z = A ↑ B and return to the statement following the CALL.

To do recursive programming, you would put a call statement within your procedure which should only be executed under certain conditions, otherwise, you would get involved in an infinite loop. Normally, parameters would be continuously modified by successive CALLs until a desired condition is satisfied.

As a simple example of recursive programming, here is a program (in extended Basic, prior to translation) to find a root of an equation using bisection:

```
 5 REM DEFINE FUNCTION IN
   LINE 10
10 DEF FNF(X) = X * X - 2
20 INPUT "ENTER A,B"; A,B
30 CALL BISECT (A,B)
50 BISECT: PROC (L,U)
60 M = (L + U)/2
70 IF ABS(FNF(M)) < 1E - 5 THEN 120
80 IF FNF(L) * FNF(M) < 0 THEN 100
90 CALL BISECT (M,U)
100 CALL BISECT (L,M)
110 END BISECT
120 PRINT "ROOT = "; M
130 END
```

Line 80 determines whether the root lies between L and M or between M and U. It then calls BISECT again with appropriate parameters (either (L,M) or (M,U)).

A Sample Run of Extend would be more confusing than helpful, so I have presented the results of a run. I wrote a program to solve simultaneous linear equations in extended Basic and then had Extend translate it into Level II. The results appear in the Figures 1 and 2. Note the comparative brevity of the Extend version.

```
                    *** EXTEND -- MAIN PROGRAM ***


10 CLS:CLEAR15000:DEFINTA-W:DIMT$(600),L(600),A(600),PR$(50),PA$(5
0),PL(50),V$(20),W$(20)
20 PRINT"                    *** EXTENDED BASIC ***":PRINT
30 INPUT"ENTER FILENAME OF YOUR PROGRAM";F$
40 CLS:PRINT"                    *** EXTENDED BASIC ***":PRINT:I=-1
50 I=I+2
60 LINE INPUT T$(I):IFVAL(T$(I))=0THEN170
70 A(I)=INSTR(T$(I)," "):IFA(I)=0PRINT"BLANK MUST FOLLOW LINE NUMB
ER--REENTER LAST LINE":GOTO60
80 L(I)=VAL(LEFT$(T$(I),A(I)-1)):IFI=1THEN50
90 IFL(I)>L(I-2)THEN50
100 FORJ=1TOI-2STEP2:IFL(I)<=L(J)THEN120
110 NEXT
120 IFL(I)=L(J)THENT$(J)=T$(I):T$(I)="":A(J)=A(I):L(J)=L(I):L(I)=0
:GOTO60
130 T$=T$(I):L=L(I):A=A(I)
140 FORK=ITOJ+2STEP-2:T$(K)=T$(K-2):A(K)=A(K-2):L(K)=L(K-2):NEXT
150 T$(J)=T$:A(J)=A:L(J)=L
160 GOTO50
170 C$=T$(I):T$(I)="":D$=LEFT$(C$,3):LL=LEN(C$)
180 L=0
190 IFC$="COM"THEN290
200 IFC$="RUN"THENAZ=-1:GOTO440
210 IFD$="DEL"THEN L=VAL(RIGHT$(C$,LL-4))
220 IFD$="LIS"THEN240  ELSEIFD$="LLI"THEN380  ELSEIFD$="BLI"THEN38
0  ELSEIFD$="SAV"THEN440  ELSEIFD$="LOA"THEN520  ELSEIFD$="NEW"THE
N620  ELSEIFD$="DEL"THEN630  ELSEIFD$="TRA"THEN660
230 PRINT"ILLEGAL COMMAND":GOTO60
240 CLS:FORJ=1TOI-1
250 IFT$(J)=""THEN270
260 PRINTT$(J)
270 NEXT
280 GOTO60
290 PRINT"SYSTEM COMMANDS ARE:"
300 PRINT"LIST":PRINT"LLIST":PRINT"BLIST     (LLIST IN LARGE CHAR M
ODE)"
310 PRINT"DEL (LINE #)"
320 PRINT"SAVE"
```

```
330 PRINT"LOAD"
340 PRINT"RUN"
350 PRINT"NEW    (START OVER)"
360 PRINT"TRAN   (TRANSLATE SOURCE CODE INTO LEVEL II)"
370 PRINT:GOTO60
380 E$=""":IFD$="BLI"THENE$=CHR$(15)
390 FORJ=1TOI-1
400 IFT$(J)=""THEN420
410 LPRINTE$;T$(J)
420 NEXT
430 GOTO60
440 IFF$=""THENINPUT"FILENAME";F$
450 OPEN"O",1,F$
460 FORJ=1TOI-1
470 PRINT#1,T$(J)
480 NEXT
490 CLOSE
500 IFAZTHENRUNF$
510 GOTO60
520 ON ERROR GOTO 580
530 OPEN"I",1,F$
540 J=0
550 J=J+1
560 LINE INPUT#1,T$(J):A(J)=INSTR(T$(J),"  "):L(J)=VAL(LEFT$(T$(J),
A(J)))
570 GOTO550
580 IFERR=106THEN610
590 IFERR<>124THENONERRORGOTO0
600 I=J:CLOSE:RESUME60
610 CLOSE:PRINT"FILE NOT FOUND":RESUME60
620 RUN
630 FORJ=1TOI-1:IFL(J)=LTHEN650
640 NEXT:PRINT"NO SUCH LINE":GOTO60
650 T$(J)="":A(J)=0:L(J)=0:GOTO60
660 CLS:PRINT@400,"EXTENDED BASIC TRANSLATOR--"
670 N=I-1
680 J=0
690 J=J+1
700 IFJ<=NTHEN760
710 GOSUB3080 ' PROCESS ALL THE 'CALLS'
720 IFFETHENGOSUB1920
730 IFFLTHENGOSUB2050
740 IFFDTHENGOSUB2610
750 CLS:PRINT"TRANSLATION COMPLETE--
BACK TO EXTENDED BASIC MONITOR":GOTO60
760 IFT$(J)=""THEN690
770 IFINSTR(T$(J),"REM")<>0THEN690
780 IFINSTR(T$(J),"DOT")<>0THEN2290
790 IFINSTR(T$(J),"VEC")<>0THEN2400
800 IFINSTR(T$(J),"MAT")<>0THEN1530
810 IFINSTR(T$(J),"DET")<>0THEN2490
820 IFINSTR(T$(J),"SUM")<>0THEN890
830 IFINSTR(T$(J),"PROC")<>0THEN2860
840 IFINSTR(T$(J),"PRD")<>0THEN1000
850 IFINSTR(T$(J),"UNTIL")<>0THEN1310
860 IFINSTR(T$(J),"WHILE")<>0THEN1110
870 IFINSTR(T$(J),"SUBSTR")<>0THEN1850
880 GOTO690
890 TX$=T$(J):GOSUB1840
900 B=INSTR(TX$,"="):IFB=0THEN990
910 T$=MID$(TX$,A(J)+1,B-A(J)-1)
920 B=INSTR(TX$,"SUM "):IFB=0THEN990
930 LL=LEN(TX$):L$=RIGHT$(TX$,LL-B-3):C1=INSTR(L$,","):IFC1=0THEN9
90
940 LL=LEN(L$):A$=LEFT$(L$,C1-1):L$=RIGHT$(L$,LL-C1):C2=INSTR(L$,"
,"):IFC2=0THEN990
950 LL=LEN(L$):S$=LEFT$(L$,C2-1):E$=RIGHT$(L$,LL-C1)
960 N$=STR$(L(J)+1):LL=LEN(N$):N$=RIGHT$(N$,LL-1)
970 T$(J+1)=N$+"  "+T$+"=0:FORKK="+S$+"TO"+E$+":"+T$+"="+T$+"+"+A$+
"(KK):NEXTKK"
980 GOTO690
990 PRINT"ILLEGAL USE OF SUM IN LINE";L(J):GOTO60
1000 TX$=T$(J):GOSUB1840
1010 B=INSTR(TX$,"="):IFB=0THEN1100
1020 T$=MID$(TX$,A(J)+1,B-A(J)-1)
1030 B=INSTR(TX$,"PRD "):IFB=0THEN1100
1040 LL=LEN(TX$):L$=RIGHT$(TX$,LL-B-3):C1=INSTR(L$,","):IFC1=0THEN
1100
1050 LL=LEN(L$):A$=LEFT$(L$,C1-1):L$=RIGHT$(L$,LL-C1):C2=INSTR(L$,
","):IFC2=0THEN1100
1060 LL=LEN(L$):S$=LEFT$(L$,C2-1):E$=RIGHT$(L$,LL-C1)
1070 N$=STR$(L(J)+1):LL=LEN(N$):N$=RIGHT$(N$,LL-1)
1080 T$(J+1)=N$+"  "+T$+"=1:FORKK="+S$+"TO"+E$+":"+T$+"="+T$+"*"+A$
+"(KK):NEXTKK"
1090 GOTO690
1100 PRINT"ILLEGAL USE OF PRD IN LINE";L(J):GOTO60
1110 TX$=T$(J):GOSUB1840 :B=INSTR(TX$,"DO"):IFB=0THEN690
1120 LL=LEN(TX$):B=INSTR(TX$,"WHILE "):IFB=0THEN1520
1130 C$=RIGHT$(TX$,LL-B-5)
1140 M=1
1150 FORK=J+1TOI-1
1160 C=INSTR(T$(K),"WHILE"):IFC=0THEN1210
1170 D=INSTR(T$(K),"DO"):E=INSTR(T$(K),"END")
1180 IFD=0ANDE=0THENPRINT"ILLEGAL STATEMENT IN LINE";L(K):GOTO60
1190 IFD<>0THENM=M+1ELSEM=M-1
1200 IFM=0THEN1230
1210 NEXTK
1220 PRINT"DO WHILE WITHOUT END IN LINE";L(J):GOTO60
1230 JJ=J:J=K:GOSUB1840 :J=JJ
1240 N$=STR$(L(K)+1):LL=LEN(N$):N$=RIGHT$(N$,LL-1)
1250 G$=STR$(L(J)+1):LL=LEN(G$):G$=RIGHT$(G$,LL-1)
1260 T$(K+1)=N$+"  GOTO  "+G$:L(K+1)=L(K)+1
1270 H$=STR$(L(K+2)):LL=LEN(H$):H$=RIGHT$(H$,LL-1)
1280 T$(J+1)=G$+"  "+"IF NOT("+C$+") THEN "+H$
1290 L(J+1)=L(J)+1
1300 GOTO 690
1310 TX$=T$(J):GOSUB1840 :B=INSTR(TX$,"DO"):IFB=0THEN690
1320 LL=LEN(TX$):B=INSTR(TX$,"UNTIL "):IFB=0THEN1510
1330 C$=RIGHT$(TX$,LL-B-5)
1340 M=1
1350 FORK=J+1TOI-1
1360 C=INSTR(T$(K),"UNTIL"):IFC=0THEN1410
1370 D=INSTR(T$(K),"DO"):E=INSTR(T$(K),"END")
1380 IFD=0ANDE=0THENPRINT"ILLEGAL STATEMENT IN LINE";L(K):GOTO60
1390 IFD<>0THENM=M+1ELSEM=M-1
1400 IFM=0THEN1430
1410 NEXTK
```

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1420 PRINT"DO UNTIL WITHOUT END IN LINE";L(J):GOTO60
1430 JJ=J:J=K:GOSUB1840 :J=JJ
1440 N$=STR$(L(K)+1):LL=LEN(N$):N$=RIGHT$(N$,LL-1)
1450 G$=STR$(L(J)+1):LL=LEN(G$):G$=RIGHT$(G$,LL-1)
1460 T$(K+1)=N$+" GOTO "+G$:L(K+1)=L(K)+1
1470 H$=STR$(L(K+2)):LL=LEN(H$):H$=RIGHT$(H$,LL-1)
1480 T$(J+1)=G$+" "+IF("+C$+") THEN "+H$
1490 L(J+1)=L(J)+1
1500 GOTO690
1510 PRINT"ILLEGAL DO UNTIL STATMENT IN LINE";L(J):GOTO60
1520 PRINT"ILLEGAL DO WHILE STATEMENT IN LINE";L(J):GOTO60
1530 TX$=T$(J):GOSUB1840 :N$=STR$(L(J)+1):LL=LEN(N$):N$=RIGHT$(N$,
LL-1)
1540 B=INSTR(TX$,"MAT "):IFB=0THEN1820
1550 C=INSTR(TX$,"="):IFC=0THEN1740
1560 A$=MID$(TX$,B+4,C-B-4):LL=LEN(TX$):L$=RIGHT$(TX$,LL-C):LL=LEN
(L$)
1570 IFLEFT$(L$,3)="INV"THENG$=" GOSUB 30000":FL=-1:GOTO1730
1580 IFL$="ZER"THENG$=" FORK1=1TON1:FORK2=1TON2:"+A$+"(K1,K2)=0:NE
XTK2,K1":GOTO1730
1590 IFL$="IDN"THENG$=" FORK1=1TON1:FORK2=1TON2:"+A$+"(K1,K2)=-(K1
=K2):NEXTK2,K1":GOTO1730
1600 IFLEFT$(L$,3)<>"TRN"THEN1630
1610 B$=MID$(L$,5,LL-5)
1620 G$=" FORK1=1TON1:FORK2=1TON2:"+A$+"(K1,K2)="+B$+"(K2,K1):NEXT
K2,K1":GOTO1730
1630 C=INSTR(L$,"*"):IFC=0THEN1660
1640 B$=LEFT$(L$,C-1):C$=RIGHT$(L$,LL-C)
1650 G$=" FORK1=1TON1:FORK2=1TON3:"+A$+"(K1,K2)=0:FORK3=1TON2:"+A$
+"(K1,K2)="+A$+"(K1,K2)+"+B$+"(K1,K3)*"+C$+"(K3,K2):NEXTK3,K2,K1":
GOTO1730
1660 C=INSTR(L$,"+"):IFC=0THEN1690
1670 B$=LEFT$(L$,C-1):C$=RIGHT$(L$,LL-C)
1680 G$=" FORK1=1TON1:FORK2=1TON2:"+A$+"(K1,K2)="+B$+"(K1,K2)+"+C$
+"(K1,K2):NEXTK2,K1":GOTO1730
1690 C=INSTR(L$,"-"):IFC=0THEN1720
1700 B$=RIGHT$(L$,LL-C)
1710 G$=" FORK1=1TON1:FORK2=1TON2:"+A$+"(K1,K2)=-"+B$+"(K1,K2):NEX
TK2,K1":GOTO1730
1720 G$=" FORK1=1TON1:FORK2=1TON2:"+A$+"(K1,K2)="+L$+"(K1,K2):NEXT
K2,K1"
1730 L(J+1)=L(J)+1:T$(J+1)=N$+G$:GOTO690
1740 C=INSTR(TX$,"INPUT "):IFC=0THEN1780
1750 LL=LEN(TX$)
1760 A$=RIGHT$(TX$,LL-C-5)
1770 G$=" FORK1=1TON1:FORK2=1TON2:INPUT"+A$+"(K1,K2):NEXTK2,K1":GO
TO1730
1780 C=INSTR(TX$,"PRINT "):IFC=0THEN1820
1790 LL=LEN(TX$)
1800 A$=RIGHT$(TX$,LL-C-5)
1810 G$=" FORK1=1TON1:?:FORK2=1TON2:PRINT"+A$+"(K1,K2);:NEXTK2,K1"
:GOTO1730
1820 PRINT"ILLEGAL MATRIX STATEMENT IN LINE";L(J)
1830 GOTO60
1840 LL=LEN(T$(J)):T$(J)=LEFT$(T$(J),A(J))+"REM "+RIGHT$(T$(J),LL-
A(J)):RETURN
1850 TX$=T$(J):GOSUB1840 :B=INSTR(TX$,"SUBSTR "):IFB=0THEN1940
1860 C=INSTR(TX$,","):IFC=0THEN1940
1870 LL=LEN(TX$):A$=MID$(TX$,A(J)+8,C-A(J)-8)
1880 B$=RIGHT$(TX$,LL-C)
1890 N$=STR$(L(J)+1):L2=LEN(N$):N$=RIGHT$(N$,L2-1)
1900 G$=" AA$="+A$+":BB$="+B$+":K1=INSTR(AA$,BB$):KK(0)=SGN(K1):IF
K1<>0THENGOSUB29000"
1910 T$(J+1)=N$+G$:L(J+1)=L(J)+1:FE=-1:GOTO690
1920 IFEF=-1THENRETURN
1930 EF=-1:RESTORE:FORS=I+11TOI+29STEP2:READT$(S):NEXT:I=I+31:RETU
RN
1940 PRINT"ILLEGAL SUBSTR STATEMENT IN LINE";L(J):GOTO60
1950 DATA"29000 KK(1)=K1:L1$=AA$:LL=LEN(AA$):II=1"
1960 DATA"29010 L1=LEN(BB$)"
1970 DATA"29020 P1=K1+L1"
1980 DATA"29030 L1$=RIGHT$(L1$,LL-P1+1)"
1990 DATA"29040 K1=INSTR(L1$,BB$)"
2000 DATA"29050 IFK1=0THENRETURN"
2010 DATA"29060 II=II+1"
2020 DATA"29070 KK(II)=K1+LEN(BB$):KK(0)=KK(0)+1:IFII>1THENKK(II)=
KK(II)+KK(II-1)-1"
2030 DATA"29080 LL=LEN(L1$)"
2040 DATA"29090 GOTO29020"
2050 IFLF=-1THENRETURN
2060 LF=-1:RESTORE:FORS=1TO10:READH$:NEXT:FORS=I+11TOI+53STEP2:REA
DT$(S):NEXT:I=I+55:RETURN
2070 DATA"30000 FORK1=1TONN:FORK2=1TONN:A(K1,K2)=-(K1=K2):NEXTK2,K
1"
2080 DATA"30010 FORKI=1TONN-1"
2090 DATA"30020 KC=1"
2100 DATA"30030 IFB(KI,KI)<>0THEN30070"
2110 DATA"30040 IFKI+KC>NNTHENPRINTCHR$(78);CHR$(79);CHR$(32);ChR$
(73);cHr$(78);ChR$(86);cHr$(69);ChR$(82);cHr$(83);ChR$(69):STOP"
2120 DATA"30050 I1=1:I2=KI+KC:KC=KC+1:GOSUB30210"
2130 DATA"30060 GOTO30030"
2140 DATA"30070 I1=KI:XK=1/B(KI,KI):GOSUB30190"
2150 DATA"30080 FORKJ=KI+1TONN"
2160 DATA"30090 XK=-B(KJ,KI):I2=KJ:GOSUB30200"
2170 DATA"30100 NEXTKJ,KI"
2180 DATA"30110 IFB(NN,NN)=0THENPRINTCHR$(78);CHR$(79);CHR$(32);CH
R$(73);CHR$(78);CHR$(86);CHR$(69);CHR$(82);CHR$(83);CHR$(69):STOP"
2190 DATA"30120 XK=1/B(NN,NN):I1=NN:GOSUB30190"
2200 DATA"30130 FORKI=NNTO2STEP-1"
2210 DATA"30140 I1=KI"
2220 DATA"30150 FORKJ=KI-1TO1STEP-1"
2230 DATA"30160 XK=-B(KJ,KI):I2=KJ:GOSUB30200"
2240 DATA"30170 NEXTKJ,KI"
2250 DATA"30180 RETURN"
2260 DATA"30190 FORKK=1TONN:A(I1,KK)=XK*A(I1,KK):B(I1,KK)=XK*B(I1,
KK):NEXT:RETURN"
2270 DATA"30200 FORKK=1TONN:A(I2,KK)=A(I2,KK)+XK*A(I1,KK):B(I2,KK)
=B(I2,KK)+XK*B(I1,KK):NEXT:RETURN"
2280 DATA"30210 FORKK=1TONN:CC=A(I1,KK):A(I1,KK)=A(I2,KK):A(I2,KK)
=CC:CC=B(I1,KK):B(I1,KK)=B(I2,KK):B(I2,KK)=CC:NEXT:RETURN"
2290 TX$=T$(J):GOSUB1840
2300 C=INSTR(TX$,"DOT "):IFC=0THEN2390
2310 D=INSTR(TX$,"="):IFD=0THEN2390
2320 A$=MID$(TX$,C+4,D-C-4):C=INSTR(TX$,"<"):IFC=0THEN2390
2330 D=INSTR(TX$,","):IFD=0THEN2390
2340 B$=MID$(TX$,C+1,D-C-1):E=INSTR(TX$,">"):IFE=0THEN2390
2350 C$=MID$(TX$,D+1,E-D-1)
2360 L(J+1)=L(J)+1:N$=STR$(L(J+1)):LL=LEN(N$):N$=RIGHT$(N$,LL-1)
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2370 G$="  "+A$+"=0:"+"FORKK=1TON1:"+A$+"="+A$+"+"+B$+"(KK,1)*"+C$+
"(KK,1):NEXTKK"
2380 T$(J+1)=N$+G$:GOTO690
2390 PRINT"ILLEGAL DOT PRODUCT STATEMENT IN LINE";L(J):GOTO60
2400 TX$=T$(J):GOSUB1840
2410 C=INSTR(TX$,"VEC "):IFC=0THEN2480
2420 D=INSTR(TX$,"="):IFD=0THEN2480
2430 A$=MID$(TX$,C+4,D-C-4):C=INSTR(TX$,"*"):IFC=0THEN2480
2440 B$=MID$(TX$,D+1,C-D-1):LL=LEN(TX$):C$=RIGHT$(TX$,LL-C)
2450 L(J+1)=L(J)+1:N$=STR$(L(J+1)):LL=LEN(N$):N$=RIGHT$(N$,LL-1)
2460 G$="  "+A$+"(1,1)="+B$+"(2,1)*"+C$+"(3,1)-"+B$+"(3,1)*"+C$+"(2
,1):"+A$+"(2,1)="+B$+"(3,1)*"+C$+"(1,1)-"+B$+"(1,1)*"+C$+"(3,1):"+
A$+"(3,1)="+B$+"(1,1)*"+C$+"(2,1)-"+B$+"(2,1)*"+C$+"(1,1)"
2470 T$(J+1)=N$+G$:GOTO690
2480 PRINT"ILLEGAL VECTOR PRODUCT STATEMENT IN LINE";L(J):GOTO60

2490 TX$=T$(J):GOSUB1840
2500 C=INSTR(TX$,"DET("):IFC=0THEN2600
2510 D=INSTR(TX$,")"):IFD=0THEN2600
2520 B$=MID$(TX$,C+4,D-C-4)
2530 C=INSTR(TX$,"  "):IFC=0THEN2600
2540 D=INSTR(TX$,"="):IFD=0THEN2600
2550 A$=MID$(TX$,C+1,D-C-1)
2560 FD=-1
2570 G$="  FORK1=1TONN:FORK2=1TONN:DT(K1,K2)="+B$+"(K1,K2):NEXTK2,K
1:GOSUB31000:"+A$+"=DT"
2580 L(J+1)=L(J)+1:N$=STR$(L(J+1)):LL=LEN(N$):N$=RIGHT$(N$,LL-1)
2590 T$(J+1)=N$+G$:GOTO690
2600 PRINT"ILLEGAL DET STATEMENT IN LINE";L(J):GOTO60
2610 IF DF THEN RETURN
2620 DF=-1:RESTORE:FORK=1TO32:READH$:NEXT
2630 FORS=I+11TOI+53STEP2:READT$(S):NEXTS:I=I+55:RETURN
2640 DATA"31000 XM=1"
2650 DATA"31010 FOR KI=1 TO NN-1"
2660 DATA"31020 IF DT(KI,KI)<>0 THEN 31110"
2670 DATA"31030 FOR KJ=KI+1 TO NN"
2680 DATA"31040 IF DT(KJ,KI)<>0 THEN 31070"
2690 DATA"31050 NEXT KJ"
2700 DATA"31060 DT=0:GOTO 31210"
2710 DATA"31070 XM=-XM"
2720 DATA"31080 FOR KK=1 TO NN"
2730 DATA"31090 CS=DT(KI,KK):DT(KI,KK)=DT(KJ,KK):DT(KJ,KK)=CS"
2740 DATA"31100 NEXT KK"
2750 DATA"31110 CS=DT(KI,KI):XM=XM*CS"
2760 DATA"31120 FOR KK=1 TONN:DT(KI,KK)=DT(KI,KK)/CS:NEXT KK"
2770 DATA"31130 FOR KR=KI+1 TO NN"
2780 DATA"31140 CS=DT(KR,KI)"
2790 DATA"31150 FOR KK=1 TO NN"
2800 DATA"31160 DT(KR,KK)=DT(KR,KK)-CS*DT(KI,KK)"
2810 DATA"31170 NEXT KK,KR"
2820 DATA"31180 NEXT KI"
2830 DATA"31190 DT=1:FORKI=1TONN:DT=DT*DT(KI,KI):NEXTKI"
2840 DATA"31200 DT=XM*DT"
2850 DATA"31210 RETURN"
2860 TX$=T$(J):GOSUB1840
2870 C=INSTR(TX$,":"):IFC=0THEN3070
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continued

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2880  B=INSTR(TX$,"  "):IFB=0THEN3070
2890  P$=MID$(TX$,B+1,C-B-1):PR=PR+1:PR$(PR)=P$
2900  N$=STR$(L(J)):LL=LEN(N$):N$=RIGHT$(N$,LL-1)
2910  PA$(PR)=N$
2920  C=INSTR(TX$,"("):IFC=0THEN2960
2930  PL(PR)=PL(PR)+1
2940  C=INSTR(C+1,TX$,","):IFC<>0THEN2930
2950  PL(PR)=PL(PR)+1
2960  FORK=J+1TON
2970  IFINSTR(T$(K),"PROC")<>0THENPRINT"NESTING OF PROCEDURES NOT A
LLOWED":GOTO60
2980  C=INSTR(T$(K),"END"):IFC=0THEN3010
2990  IFINSTR(C+3,T$(K),PR$(PR))=0THEN3010
3000  GOTO3030
3010  NEXTK
3020  PRINT"PROCEDURE WITHOUT END IN LINE";L(J):GOTO60
3030  SJ=J:J=K:GOSUB1840 :J=SJ
3040  L(K+1)=L(K)+1:N$=STR$(L(K+1)):LL=LEN(N$):N$=RIGHT$(N$,LL-1)
3050  T$(K+1)=N$+"  RETURN"
3060  GOTO690
3070  PRINT"ILLEGAL PROC STATEMENT IN LINE";L(J):GOTO60
3080  J=0
3090  J=J+1
3100  IFJ>NTHENRETURN
3110  IFT$(J)=""THEN3090
3120  C=INSTR(T$(J),"CALL "):IFC=0THEN3090
3130  LL=LEN(T$(J))+1:P=INSTR(T$(J),"("):IFP=0THENP=LL
3140  P$=MID$(T$(J),C+5,P-C-5)
3150  FORK=1TOPR
3160  IFPR$(K)=P$ THEN 3190
3170  NEXTK
3180  PRINT"NON EXISTENT PROCEDURE CALLED IN LINE";L(J):GOTO60
3190  N$=PA$(K):M1=PL(K):IFM1>0THENM1=M1-1
3200  TX$=T$(J):GOSUB1840
3210  L(J+1)=L(J)+1:M$=STR$(L(J+1)):LL=LEN(M$):M$=RIGHT$(M$,LL-1)
3220  IFM1=0THENT$(J+1)=M$+"  GOSUB "+N$:GOTO3090
3230  J1=0
3240  J2=0
3250  J2=J2+1:IFINSTR(T$(J2),"PROC")=0THEN3250
3260  J1=J1+1:IFJ1<KTHEN3250
3270  KK=J2:CO=INSTR(T$(KK),"("):CC=INSTR(TX$,"(")
3280  IFCO=0 OR CC=0 THEN PRINT"PROGRAM ERROR":STOP
3290  FORJ2=1TOM1
3300  IFJ2<M1THEN3320
3310  C1=INSTR(CO+1,T$(KK),")"):C2=INSTR(CC+1,TX$,")"):GOTO3330
3320  C1=INSTR(CO+1,T$(KK),","):C2=INSTR(CC+1,TX$,",")
3330  W$(J2)=MID$(T$(KK),CO+1,C1-CO-1)
3340  V$(J2)=MID$(TX$,CC+1,C2-CC-1)
3350  CO=C1:CC=C2
3360  NEXTJ2
3370  X$=M$+"  "
3380  FORJ2=1TOM1
3390  X$=X$+W$(J2)+"="+V$(J2)+":"
3400  NEXTJ2
3410  T$(J+1)=X$+"GOSUB "+N$
3420  GOTO3090
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HARRY SHERSHOW — Dept. Editor

The Nerve of a Chess Player!

A Book Review
BY HARRY SHERSHOW

Chess players have always been considered a curious lot, afflicted with more neurotic symptoms than any other single class of gamesmen. Their hands tremble, their muscles stiffen, they assume immoveable poses for hours at a time (like hunter's dogs), and they adopt strict regulations for themselves; such as, no noise! no talking! no smoking! no touching of pieces! no heavy breathing! Admittance into the inner sanctuary of a chess club is like wandering into a chapel. All the members sit quietly, staring somberly at each other. No one smiles and no one moves. They are a strange lot. They rarely applaud the victor of a game. Usually they commiserate with the dejected loser and gleefully show him where he went wrong. To the vanquished this is a second whipping, but such are the ways of these chess people. One has always wondered when some psychiatrist was going to come along, analyze this cult and then offer some explanation for "chess club syndrome." Someone now has done that.

Kenneth Colby is Professor of Psychiatry, Behavioural Sciences and Computer Sciences at UCLA. He is also a Class A chess player. Therefore, he should know more about the peccadilloes of chess players than your average pedestrian observer. His new book, "Secrets of a Grandpatzer" (with a subtitle of "How To Beat Most People and Computers at Chess") must rank among the best chess books ever written. He offers advice on how to beat your opponent (man or machine) by carefully dissecting the mechanics of the game down to their logical elements. The book is a masterful exposition of such ploys as "How to Study," "How to Play," "How to Miscellaneous," plus usual instructions on planning strategy and counterattack. But it is between the game lines, though, where the book shines brightly.

"Speaking of being nervous and being drunk," writes Dr. Colby for example, "I have found it useful to be slightly swacked at the start of a game. Holov, a Soviet grandmaster, was once suspended from tournaments for a year for drinking too much. He went a bit too far with it, but he sure could make some great moves. In this position: . . ." (see the book.)

At another place, the author says, "John Dewey said the deepest human urge is to feel important. Nobody wants to be a nobody. It is precarious to use chess as a way to defeat a sense of nobodiness. (If a Martian came here, he would be astounded to hear of the powers of our **Nobody**: **Nobody** is perfect; **Nobody** can give birth to himself; **Nobody** can be in two places at once.)"

Other Colby observations:

"Shame and humiliation originate in childhood from being ridiculed and treated with contempt by others. Of all the various types of game-players and athletes I have known, chess-players suffer most from emotions of contempt.

"Most masters I know have absolute contempt for chess-playing computers, but of course there is a growing threat to them here."

"I remember vividly a tournament opponent of mine who was a 75-year-old trembly-handed janitor for a grammar school in a back-country California town. He opened the game atrociously, moving the same Knight four times. I couldn't believe he would ever want to enter a tournament. He won the game!"

"Nimzovich once protested allowing a 'stupid idiot' of a player to enter a tournament and then lost to him!"

"All sorts of pressures besiege the player over the board. A general inventory of them is of little use. Each Grandpatzer must find, know, and attempt to control his own. One man's meat is another man's poison. I know players who become so extremely tense and excited when they have a winning position that it is unbearable to watch them because they are so vulnerable to making a quick blunder in this state. Other players look so cool and nonchalant that only careful study of the board reveals they are absolutely lost."

"Alekhine felt chess was a matter of vanity. Capablanca in 1913, had the Mayor of Havana clear the playing room so no one would see him resign to Marshall. If you size up your opponent as 'dumb', you ('the great me') are in great danger from your most dangerous opponent, yourself. 'Vanity rather than wisdom determines how the world is run,' said Vonnegut."

"Life is more than just ham sandwiches and beer. Humans strive to not to survive, but to enhance the *quality*, the excellence, of survival. Happy people, without artistic goals, vegetate in incomplete, hobbled and impoverished lives."

"Players of the future may begin to use chess programs during adjournments which should bring an end to our long-standing absurdity of having several consultants help out a player with adjourned games . . .After all, Queens and clocks were introduced to speed up the game (over resistant opposition) but we take them as sensible now."

There are 140 pages sparkling with more of the preceding observations and you surely will spend an enjoyable evening looking for them. "Secrets of a Grandpatzer" is a chess book that one will read rather than study. More than 100 chess diagrams are included, together with corresponding game documentation, to soothe the appetites of the hungriest players. If you absorb all the advice that Dr. Colby offers, you could become a formidable opponent for both people and computers. To strengthen your level of play, the doctor claims, you must understand not only many secrets of the outer game of chess but also those of the inner ego game of chess players. For such professional advice alone the book is a bargain regardless of its price. After all, if you were lying on the couch in Dr. Colby's office, listening to him read aloud, you would be paying him $25 or $50 an hour. Indeed, this is a bargain.

To order this sparkling chess book for yourself, or as a gift for one of your grumpy chess-playing friends (to improve his disposition) refer to the ad in the classifieds of this section.

Rating BORIS 2.5

BY DAVE WELSH

David E. Welsh, who wrote this analysis, is a consulting mechanical engineer specializing in product design and development. The modular game system unit formerly marketed under the name of Sargon 2.5, by Chafitz Co., is currently being marketed as BORIS 2.5 by Applied Concepts. No adamant statement on this change has as yet been issued by either company as apparently they are involved in some litigation.

Best of the "standalone" computer chess games at this date is Boris 2.5 (formerly known as SARGON 2.5). The program is in a small ROM module, which plugs into a housing containing microprocessor, keyboard and display. Later versions, or other games (a strong checkers module is reportedly ready) will be available at modest cost.

The System

Boris 2.5 runs on a 6502 microprocessor with 8K of ROM and only 2K of RAM. Its clock speed of 2 MHz lets the "stand alone" run twice as fast as an Apple II Sargon II cassette, and three times as fast as the TRS-80 cassette. The system features a flourescent display and audio feedback for keyboard entry, illegal moves, announcing the machines move, and checkmate or stalemate. Contrary to rumor, the current microprocessor is not the same one that was used in earlier Boris models.

The original Sargon program was developed by Dan and Kathe Spracklen. Work began in September 1977, when Dan started writing symbolic pseudocode (they didn't have a computer yet). In November, Kathe joined the effort, and in December they took delivery on a Jupiter III microcomputer, and began translating the program into Z-80 assembly language and designing interface graphics. Like most programs, Sargon needed lots of "debugging" and by the end of January 1978, it would make legal moves but little more. Programmers will realize the effort needed to finish the program in just one month, in time to play in the first microcomputer chess tournament on March 3, 4 and 5 at the West Coast Computer Faire. Sargon easily won the tournament with a 5-0 score. A listing of the program at this stage was published as "Sargon — A Computer Chess Program" by Dan and Kathe Spracklen, Hayden Book Co., 1978.

The Spracklens did not rest on their laurels, but continued to improve their program during 1978, concentrating on move selection logic and algorithm efficiency. In December, 1978 the improved Sargon II was invited to the ninth annual North American Computer Chess Championship tournament, where it made computer and chess history by tying for third place — defeating the powerful mainframe program AWIT in the final round. By then, Sargon II was generally recognized as the microcomputer world Chess champion. In February 1979, Chess Challenger 10 won the Penrod Memorial Microchess tournament to qualify as its "challenger". In the championship match Sargon II beat Chess Challenger 10 quite handily.

The tenth North American Computer Chess Championship in October 1979 saw Sargon 3.0 finish in seventh place, losing to the second and fourth place mainframes, and drawing with mainframe BLITZ 6.9. Sargon easily won its game with microcomputer MYCHESS (running on a 64K Cromemco Z-2D), and put up a terrific battle against 1978 champion BELLE — declining a draw offer at the 38th move and eventually losing. Sargon 3.0 then traveled to London for the second annual European Microcomputer Chess Championships in November 1979, scoring an easy 5-0 victory. In an exhibition game after the tournament, Sargon trounced Voice Chess Challenger in a blitz game at Queen odds!

Sargon 2.5, developed for the Modular Game System, made its debut in the seventh annual Paul Masson American Class Championships, June 30-July 4, 1979. Competing in Class C, it scored 3½-1½ for a 1641 USCF event rating. In the San Jose City College Open in January 1980, Sargon increased its USCF rating to 1736.

The Program

Boris 2.5 (or Sargon 2.5, depending on what model you have) has seven levels of play: 0 (instantaneous response), 1 (10 seconds), 2 (20 seconds), 3 (60 seconds), 4 (3 minutes), 5 (30 minutes), and 6 (3 hours). Level 0 only examines the opponent's possible replies; the number of the other levels indicates the minimum number of look-ahead plies in the programs full-width search. As the game progresses, there are fewer pieces to consider, and the search depth increases. The program selectively examines certain moves beyond the full-width search, to as much as 9 or 10 plies.

Sargon's search algorithm is very efficient. In my review of Chess Challenger 7 (Personal Computing, Jan. -Feb. 1980), a "mate in two" problem was used to measure CC 7's search rate at 30 positions/second. Sargon solved it at a 90 positions/second clip, and demonstrated the efficiency of selective search in game situations by finding the 4 move combination from Welsh-Dunning, 1968 in only 32 minutes — a 150:1 improvement over CC 7!

Sargon's program incorporates long-range planning and sophisticated positional evaluation parameters. Although it can be outplayed by a strong human, Sargon rarely makes serious positional miscalculations, and never commits the gross blunders that mar the play of other chess microcomputers. It is the only microcomputer that can formulate a strategic plan.

USCF Rates Sargon 2.5 above 85% of Tournament Players

Sargon 2.5's provisional USCF rating of 1736 is compared to the ratings of USCF members in Diagram 1. The area under the curve represents the number of rated players, and the per-

centile ranking for a given rating r is found by,

$$P(r) = \frac{\int_{r_{min}}^{r} N(r)dr}{\int_{r_{min}}^{r_{max}} N(r)dr}$$

Carrying out the integration graphically ranks Sargon in the 86th percentile. Chess Challenger 7 would rank in about the 35th percentile. From the USCF rating formula approximate odds can be derived, which illustrate the significance of a rating difference:

Difference in Ratings	Odds favoring Stronger
100	5:3
200	3:1
300	7:1
400	15:1

Sargon's Style of Play

Sargon likes classical positions with strategy revolving around control of the center. Its opening "book" is only 3 moves deep (compared to 4 for CC 7). The Auto-Response board version has a much larger opening "book" because no display messages are stored in ROM.

Sargon conducts the Black side of the Sicilian Defense particularly well, playing an early . . .e5 and obtaining positions characteristic of Lowenthal and Boleslavsky variations. Open games such as the Ruy Lopez, Giuoco Piano, Scotch Game and Two Knights' Defense suit Sargon's style better than slow closed openings like the King's Indian Attack. Against the King's Indian Defense of the Pirc-Robatsch, Sargon plays well, building up a classical "big center".

In the middle game, Sargon plays aggressively when it senses a weakness, and is dangerous on the attack in an open position. In slow maneuvering games, Sargon misses chances for positional attacks but does not spoil its own position — it marks time, waiting for the opponent to start the action. On defense, Sargon counterattacks and takes risks, accepting gambits and sacrifices as a point of honor, and undervaluing the attacker's initiative. This makes it an exciting opponent for the gambit player.

Endgames are not 2.5's strongpoint, though it is much better at endings than other microcomputers, and considerably improved over Sargon II. With King and Queen or Rook vs. King, Sargon mates in at most 15 moves at Level 1. With the advantage of two Bishops, Sargon mates in at most 17 moves at Level 3, but draws at Level 2. Sargon cannot carry out the difficult mate with a Bishop and Knight advantage from the general position (White: K,a1; B,d1; N,d8 — Black: K,d4), tending to drive the King into the wrong corner and being unable to drive him over from there to the right corner. In a favorable position, where the King has to go to the right corner (White: K,f4; B,e4; N,c4 — Black: K,f2) Sargon can carry out the mate at Level a4.

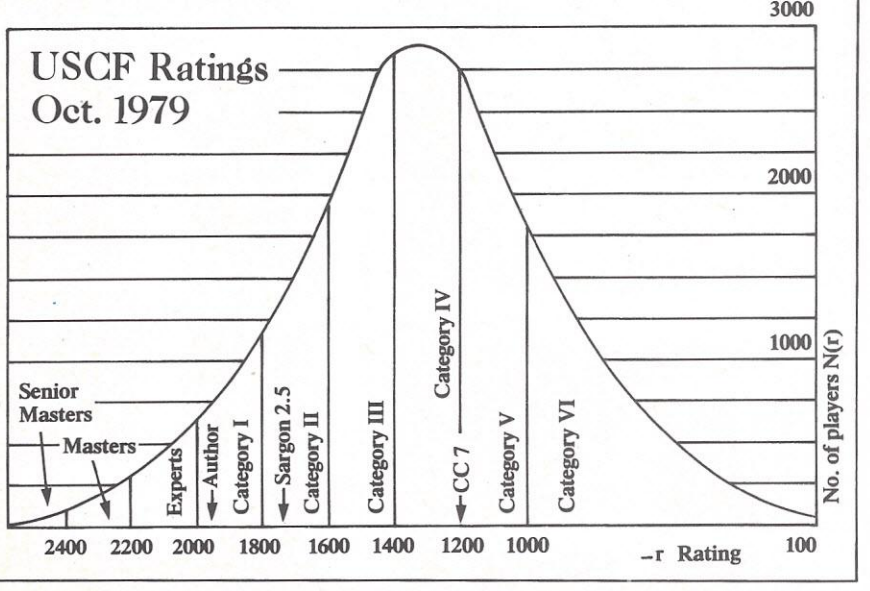
King and Pawn endings present problems that Sargon cannot yet solve — for example, the classical position (White: K,e3; p,d2 — Black: K,d5) in which Sargon always plays 1 d4, drawing, instead of 1 Kd3, winning. Even in a more favorable position (White: K,d4; p,d3 — Black: K,e6) Sargon goes wrong: 1 Kc5 Ke5 2 d4+ Ke6 3 d5+, drawing, instead of 3 Kc6, winning. In these and more complicated endings with Pawns and pieces, Sargon fails to win won positions but defends fairly well.

One important feature in Sargon's endgame play is the change in its move evaluation algorithm at move 30, to allow Sargon's King to play a more aggressive role. This can have interesting results in games where many pieces are left when the algorithm changes (see match game 3, Level 4).

Sensation at the Herman Steiner Chess Game

On Sargon's first visit to the Herman Steiner Chess Club in Los Angeles, it was challenged by a wily veteran whose rating, before retiring from tournament play, was in the high 1900's. The game was played at Level 4, and in the apparently balanced position of Diagram 2, Sargon (Black) unleashed a terrific attack:

Diagram 1



BORIS 2.5 vs. 1900 PLAYER
(Level 4)

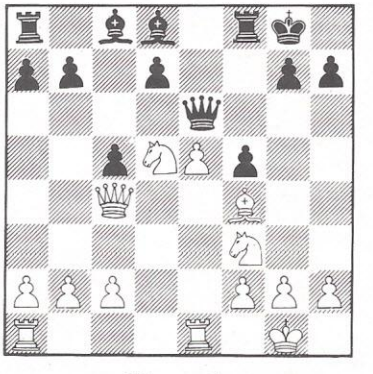


Diagram 2

1. . . .	b5!
2. Qd3	Bb7
3. Ne3	. . .

Rad1 was better

3. . . .	c4
4. Qe2	g5
5. Nd4	. . .

White must lose a piece, so he seeks attacking chances

5. . . .	Qb6
6. Nexf5	gxf4
7. Qh5	. . .

White does seem to have some threats: I was hoping Sargon would play . . .Qg6. Instead:

7. . . .	Rxf5!!
8. Nxf5	Qxf2+
9. Kh1	Ng3+!
10. hxg3	Qxg2 mate!

Bravo!

Other opponents at Level 4 weren't able to finish their games. These fragments are interesting:

White — Category III:
Sicilian Defense

1. e4	c5
2. Nf3	d6
3. d4	cxd4
4 Nxd4	e5
5. Nb3	. . .

Nb5 was better

5. . . .	Nc6
6. c4	Nf6
7. Nc3	Be7
8. Be2	Be6
9. 0-0	0-0
10. Be3	Rc8
11. Nd2	a6
12. b3	. . .

Rc1 was better

12. . . .	Nd7!
13. f4	exf4
14. Bxf4	Bf6!

Sargon now wins a Pawn:

15. Rc1	Qa5
16. Qc2	Nb5
17. Qb1	Bxc3
18. Rxc3	Nxa2−+

White — Expert:
King's Indian Attack

1. Nf3	d5
2. g3	c5
3. Bg2	Nc6
4. 0-0	e5
5. d3	Be7
6. e4	Be6
7. exd5	Qxd5
8. Re1	Qd6
9. Nc3	0-0-0?!

Risky — Sargon underestimates White's attacking chances

10. a3!	Nf6
11. b4	cxb4
12. axb4	Qxb4
13. Bd2	Qc5
14. Qb1	. . .

With strong pressure for the Pawn

14. . . .	Ng4
15. Re2	f6
16. h3	Nh6
17. Qb2	Nf5
18. g4	Nfd4
19. Nxd4	Qxd4
20. Re4	Qd6
21. Rea4	a6
22. Be3	Rd7
23. Rb1	Rhd8?!

Better was . . .Kd8 escaping to the Kingside

24. Ne4	Qb8±

Now White could cash in by

25. Nxf6	Bxf6
26. Bxc6	Rc7

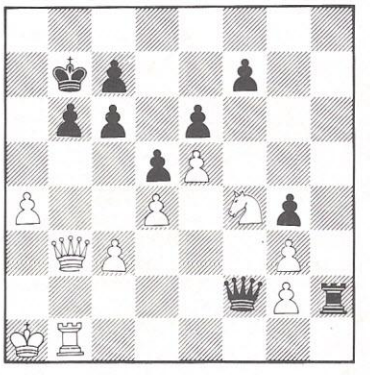
27. Rxa6 with a Pawn plus.

Rapid Transit at Level 2

Most of the games at the Steiner Club were played at Level 2, with the challenger allowed 5 minutes on a chess clock and Sargon having 12 minutes on its internal clock — keyboard time not counting. This works best with a non-playing Sargon operator, but the solitaire version is also fun once the distraction of keyboarding is mastered.

Sargon is surprisingly good at this, enjoying a big plus score against all comers. It sees much further than one would expect at Level 2 — for example, in the position of Diagram 3, from a rapid-transit game, D. Welsh — Chess 4.8 which continued: 1 a5!? Qxg3? *After . . .Rh8! White resigns* 2 axb6 Qxf4 3 bxc7+ *"Oh, you had THAT!"* Kxc7 and White announced mate in 3. When Sargon was confronted with this position at Level 2, it answered 1 . . .b5 evading the trap.

BORIS 2.5 Tests a Problem
(Level 2)



End Position: Welsh vs. Chess 4.8

Here are two interesting rapid-transit games against a Category II player:

Black:
Sargon 2.5 Scotch Game

1. e4	e5
2. Nf3	Nc6
3. d4	exd4
4. Nxd4	Bc5
5. c3?!	Bxd4?!

Sargon loves to exchange Bishop for Knight

6. cxd4	Nf6
7. e5?!	Qe7
8. Be2	Ne4
9. Nc3	Qb4
10. Qd3	d5
11. f3	Nxc3
12. bxc3	Qe7
13. a4!	Qd8
14. Ba3	f6
15. exf6	Qxf6
16. 0-0	Bf5
17. Qb5	0-0-0
18. a5	Qe6

a6 was essential

19. Rfe1	Qe3+
20. Kh1	Qxc3
21. Rec1	Qxd4

Sargon is a Pawn-snatcher

22. Bc5	Qf6
23. a6	. . .

White presents the bill for damages

23. . . .	b6
24. Bg1	Nd4?

Nb8 was the only chance

25. Bxd4	Qxd4
26. Qc6	Qe5
27. Bb5	Qxh2+
28. Kxh2	Rd6
29. Qa8	mate

White:
Sargon 2.5 Pirc-Robatsch

1. e4	d6
2. d4	Nf6
3. Nc3	g6
4. Nf3	Bg7
5. Bc4	0-0
6. Be3	Bg4
7. 0-0	Nd7
8. Re1	e5
9. Qe2	a6
10. Rad1	. . .

Economical development

10. . . .	Qc8
11. Rd2	b5
12. Bd5	Rb8
13. Red1	b4
14. dxe5!?	. . .

Safer was Nb1, but this is an impressive combination for rapid-transit

14. . . .	bxc3
15. cxd6	cxd2
16. fxg7	Kxg7
17. Qxd2	Bxf3
18. Qd4+	Ne5
19. gxf3	Kg8
20. Kg2	Qd7
21. Bb3	Rbd8
22. Bc4	c5?!
23. Qd5	Qe6?

Nxc4 is better

24. Qxe6	fxe6
25. Bxe6+	Kg7
26. Bg5!	Rde8
27. Rxd6	Nxf3
28. Rd7+	. . .

And Black's flag fell in a lost position, e.g.

28. . . .	Kh8
29. Be7!	Rf4
30. Kg3	g5
31. Bf5	

Boris 2.5 vs. Sargon II

A friend arranged to play his Apple II version of Sargon II against Boris 2.5. Both have the same 7 levels of play, but Boris 2.5 can predict a move and think on the opponent's time. With its faster clock speed, this allows Boris 2.5 to play much faster. Due to the similarity between the programs, Boris 2.5 anticipated most of Sargon II's moves and had an answer ready. Two games were played at Level 3, Boris 2.5 winning both. These games will be shown in next month's continuation of this article. Whether you have the stand-alone unit labeled Sargon 2.5 or the unit called Boris 2.5, you have the best around — as of September 1st. After that date, a number of computer chess tournaments have been scheduled. Perhaps by the time you read this, a new king will be on the throne.

Six Test Problems for Chess-Playing Machines

BY DR. W. W. FOSTER

Here's a sobering thought: if you are rated 1500 or below, you are now able to purchase a preprogrammed, chess computer for a few hundred dollars or less that will beat you consistently at chess! (And every year sees the machine ratings creep upward.)

Today, there are at least 10 preprogrammed models on the market, the best known being the BORIS 2.5 series, as well as home computer programs such as, SARGON I, SARGON II, and MYCHESS, all running on an Apple, Pet or TRS-80.

Of course, if you have friends, you can try one of the programs designed for the ultrafast, large mainframe computers like Tom Truscott's DUCHESS at Duke (written by Tom Truscott, Bruce Wright and Eric Jensen), Ken Thompson's BELLE at Bell Telephone Labs in New Jersey, or David Slate and Larry Atkins' CHESS 4.9 at Northwestern University.

The real dilemma for most of us, however, is which unit will play the strongest chess within a reasonable time limit for the most reasonable price.

I personally have owned five of the home units and have tested two others. Also, I have written to all of the manufacturers asking for information and have collected results from several microchess tournaments.

First, let me remind you that information in the past from the manufacturers was for the most part misleading. Long after two 1978 tournaments were played in which an early BORIS model did poorly, I was assured in a letter dated 9/7/79 that regarding BORIS "as of now, there is not a stronger computer on the market."

As to the microchess tournaments, the results were sometimes contradictory and not reproducible. But they did have some value. In the 1978 West Coast Computer Fair, SARGON II beat CHESS CHALLENGER-10 by 5 points to 3, but in the Personal Computing Microchess tournament in 1978, CHESS CHALLENGER-10 finished ahead of SARGON I with 11 points to 8-1/2. These tournaments were, however, too infrequent and the technology is continuously improving.

What is needed is a simple, easy-to-apply test for each new program that would rate chess playing speed and strength. To this end, I have used the first six problems in *Reinfeld's 1001 Brilliant Ways to Checkmate* (1979 Edition, Published by Wilshire Book Company, 12015 Sherman Road, No. Hollywood, CA 91605), and recorded the time required to solve these 2, 3 and 4 move problems. Also, Tom Truscott at Duke University has tried these problems on DUCHESS and has arranged for them to be run on BELLE, for comparison purposes.

DUCHESS solved problems 1, 2, 3, 4, and 6 in less than one second each! Also, DUCHESS found the unusual Move 2 . . .Kd7 for Black in problem 5 which was not considered by Reinfeld

RESULTS: The "Foster" Test:

Problem	Length	Early BORIS	CHALLENGER-7	BORIS-2.5	DUCHESS
1	4 Moves	No solution in 24 hours	No solution in 8 hours	Missed the mate (tested on its highest level)	Solved it in 0.24 seconds
2	2 Moves	Solved it in 2 hours	Solved it in 14 minutes	Solved it in 50 seconds	Solved it in 0.23 seconds
3	2 Moves	Solved it in 11 minutes	Solved it in 3 minutes	Solved it in 25 seconds	Solved it in 0.32 seconds
4	3 Moves	Not tested	Solved it in 33 hours	Solved it in 8 min. 24 sec.	Solved it in 0.32 seconds
5	3 Moves	Not tested	No solution in 10 hours	Found the best move in 18 min. Also found "The Cook"	Duchess "Cooked" the problem. See Below
6	2 Moves	Solved it in 35 minutes	Solved it in 4 minutes	Solved it in 48 seconds	Solved it in 0.6 seconds

and which delays mate for several moves! Similarly, BELLE solved them all in about the same time as DUCHESS and also in problem 5 discovered the "cook" 2 . . .Kd7 for Black.

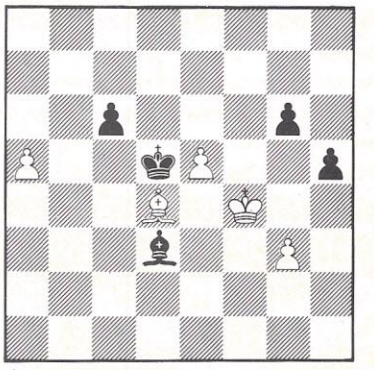
Clearly, CHALLENGER-7 was stronger than early BORIS, but BORIS-2.5 was significantly stronger than the "7". Since the "Foster Test" indicated that BORIS-2.5 was stronger than "7", I tested the validity of this result by matching these two machines in a two game contest using level 3 on BORIS-2.5 (45 to 90 seconds per move) and also level 3 on CHALLENGER-7 (one minute, 20 seconds per move). According to BORIS-2.5's internal clock, it used an average of 68 minutes per game and CHALLENGER-7 used 81 minutes. BORIS-2.5 won both games within 50 moves.

In other testing, BORIS-2.5 was notably stronger than CHALLENGER-7 when shorter time limits were used for both computers. At longer time limits, BORIS-2.5 was still stronger than CHALLENGER-7, but the relative difference in their respective strengths was less. Also, BORIS-2.5 playing at 10-15 seconds per move (level 1) beat CHALLENGER-7 at one minute and twenty-seconds per move (level 3) consistently.

As to CHALLENGER-10 and VOICE CHALLENGER: my own experience with these machines tells me that VOICE CHALLENGER and "7" are equally strong, but "VOICE" has a larger opening Book in memory and, of course, it can speak. CHALLENGER-10 is weaker than "7" or "VOICE." The BORIS MASTER (another model of the early Boris series) runs the "Master chip" and so is said to be twice as fast as BORIS. It may be better in this one regard; (speed) than the BORIS, but it has the same algorithms (programs).

BORIS-2.5 has a capability for thinking on the opponent's time and has a replaceable module so it can be updated in the future. It seems to be an improved version of the Sargon-II program by Dan and Kathe Spracklen, with some ideas borrowed from Dr. Hans Berliner, an authority on artificial intelligence, and from the Chess 4.9 program. This machine also has a reverse! If you make an error you can back up as many as three moves.

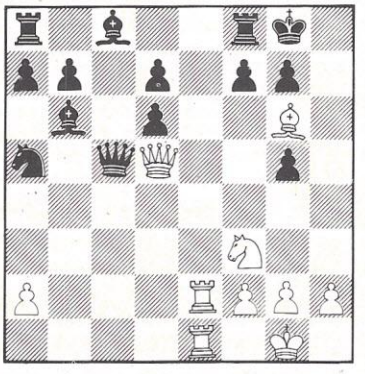
A Machine Fault



After White's move of Kg5, the Computer knocks off White's Bishop but lets the pawn get away.

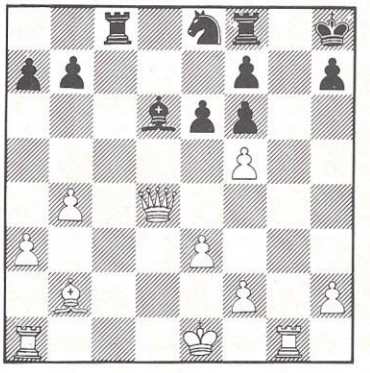
I am currently rated 1600. I played BORIS-2.5 a two game match under

Reinfeld's Problem 1



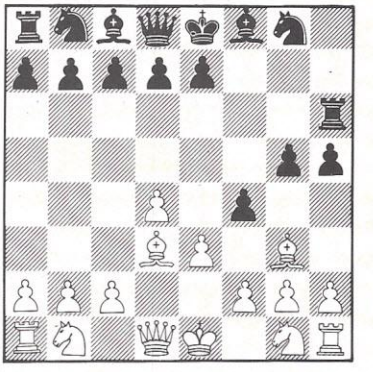
White mates in 4

Reinfeld's Problem 2



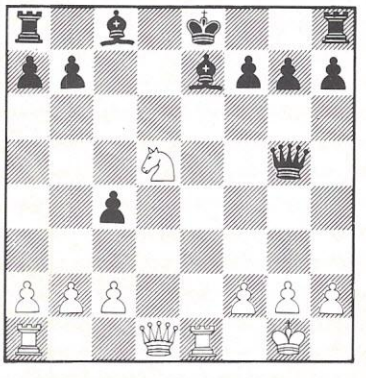
White Mates in 2

Reinfeld's Problem 3



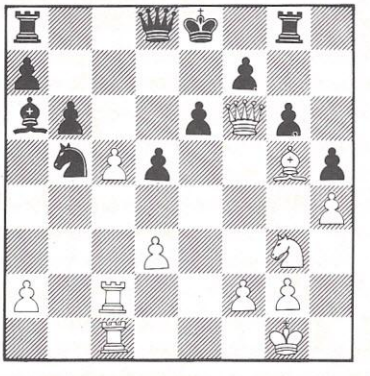
White Mates in 2

Reinfeld's Problem 4



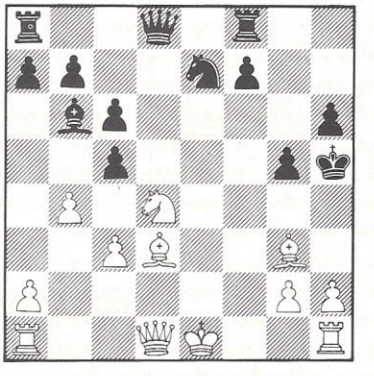
White Mates in 3

Reinfeld's Problem 5



White Mates in 3

Reinfeld's Problem 6



White Mates in 2

tournament conditions (i.e. 40/90) and won both games with reasonable ease. At 5-minute chess, however, BORIS-2.5 often beats me. It, of course, does not make tactical errors.

But before you rush out to buy BORIS-2.5 consider this Machine Fault Diagram reached in one of my games with it. Here I played Kg5 and BORIS-2.5 replied. . .KxB?, then e6, etc. and the pawn can't be stopped! Very few human players would make this error, except in time pressure, but the dedicated computers all play poorly in the end game because of the "horizon" effect, i.e., they can't calculate beyond about four moves. Advantages beyond four moves such as queening the pawn in the above example are not considered.

In summary, I believe there are two best buys: If you are rated 1300 or below, you may pay about $90.00 for CHALLENGER-7 and expect it to give you a good game, or if you are rated higher you can pay around $300 for the SARGON-2.5 system (also sold as BORIS 2.5) and expect it to give you a real challenge at the higher levels. Both units are easy to operate.

Any readers who have access to MYCHESS or any other chess computers are invited to present Reinfeld's six problems to their machines and to send the results (plus other pertinent information or inquiries) to me for a follow-up article. *(Dr. W. W. Foster can be reached at 3617 Lubbock Dr., Raleigh, NC 27612.)*

What Chess Programs Don't Do (Part I)

BY NORMAN WHALAND

Chess programs are caricatures of human chess reasoning. They emphasize a few of the methods used by human players and neglect many others. Because sheer speed partially compensates for the limitations of the programs' simplified reasoning, the best of them are able to compete with strong amateurs. There are indications that the ability of programs is reaching a plateau, however. Machine play at the master level is likely to require further ideas borrowed from human chess reasoning.

As former world champion Dr. Emanual Lasker pointed out (in *Lasker's Manual of Chess*, available as a Dover paperback), there are two essentially different ways of looking at a chess position. We can think forward from the given position, trying out forcing moves in the hope of hitting upon an advantageous sequence. Alternatively, we can think backward from a goal. Thinking backward is more complicated, in that we must not only decide on a goal, but must also know how to select moves appropriate for reaching it. The compensating advantage is that goals restrict the search and thereby deepen it.

Programs use the thinking-forward method almost exclusively. They typically have a few broadly applicable strategic goals, such as development of the pieces, pressure on the opponent's king position, and control of the center. Since some of the goals aren't appropriate for all stages of the game, the programs modify their goals at the transitions from opening to middlegame and from middlegame to endgame. For the most part, however, the goals don't change from move to move, and they aren't specific enough to narrow the search very much.

Human players set a much wider variety of goals, both strategic and tactical. Their goals are determined not merely by the stage of the game but also by specific features of the position, such as weak pawns, immobile pieces, or weaknesses of the king's position. In addition, goals are derived from the results of dynamic analysis. Highly specific tactical goals drastically limit the search, so that people can find much longer combinations than programs can. Precise strategic goals give human play a consistency of purpose that is particularly important in the endgame.

The incorporation of more goal-directed thinking in chess programs may significantly improve their performance. The examples that follow illustrate the kinds of goals that can occur, the ways in which they are set, and the effects that they have on the choice of moves. Brief and incomplete as this survey is, it gives some indication of the benefits as well as the difficulties of the use of goal setting in programs.

A Target Square

One of the most common goals is the exertion of pressure on a particular

RUBINSTEIN vs. SALWE, (Lodz 1908)

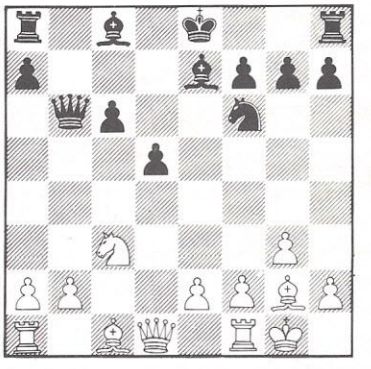


Diagram 1. Position after 10...Be7

square. The choice of the square is usually determined mainly by the pawn structure. Sometimes the pressure is directed against a freeing pawn move. If the square can't be defended by an enemy pawn, the aim is to occupy it with a piece. Both motives can be seen in the following example.

Black's c pawn is potentially vulnerable because it is backward on an open file. Its advance is prevented for the moment by white's pressure on the d pawn. On the other hand, if black should later succeed in mobilizing his central pawns, they could become a powerful weapon. Consequently, control and occupation of c5 are crucial. So vital did Rubinstein consider this goal, that he violated several principles of the opening in its pursuit.

11 Na4. He breaks three rules at once: he moves a piece twice in the opening, moves a knight to the rim, and removes pressure from the center.

11...Qb5 12 Be3. It's almost always bad to block a center pawn like this. The problem for chess programmers is to prevent such a move most of the time while enabling the program to recognize the exceptions.

12...0-0 13 Rc1 Bg4 14 f3. It's not nice to block one's own bishop, but white prefers not to divert resources from the main task. The c5 goal influences all of his choices.

14...Be6 15 Bc5 Rfe8 16 Rf2 Nd7 17 Bxe7. This move is necessary to keep open the possibility of occupying c5 with a piece.

17..Rxe7 18 Qd4 Ree8 19 Bf1 Rec8 20 e3 Qb7 21 Nc5 Nxc5 22 Rxc5. The pawns are finally blockaded, weak, and useless. White won a pawn in a few more moves.

The selection of c5 as the target square depended on simple criteria, easily implemented on a computer. Sometimes the relative importance of the square is more obscure.

Hidden Goals

In most positions, several plausible goals suggest themselves. Static considerations may not be sufficient to decide among them. Sometimes the crucial goal is evident only in future positions visualized in analysis. In this position, Alekhin thought for one-half hour before choosing a target square.

MARSHALL vs. ALEKHIN (New York 1929)

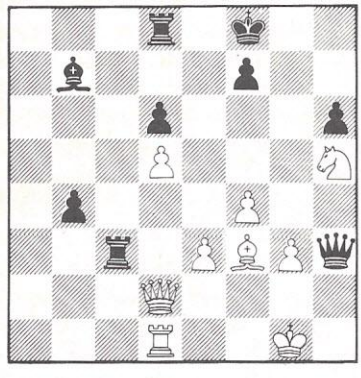


Diagram 2. Position after 42. Qd2

Black is the clear exchange ahead and also has positional advantages. He has a passed pawn, and his queen exerts cramping pressure. nevertheless, Black's task is difficult because of his exposed king and his loose, ineffective pieces at d8 and b7.

White's immediate threat is **42 Qd4** followed by Qh8+. Black has no good way of preventing the invasion and can only try to blunt its effect. The removal of white's queen would increase the danger to his own king, suggesting that black counter the threat by increasing his pressure there. On the other hand, defensive measures in black's own king's field may be in order. Alekhin considered, among others, this variation:

41...Ba6 42 Qd4 Rc2. White must now proceed by a series of checks to avoid instant checkmate.

43 Qh8+ Ke7 44 Qf6+ Kd7 45 Qxf7+ Kc8 46 Qe6+ Qxe6 47 dxe6. Black can no longer expect to win. If black had controlled e6, white would have run out of checks and lost. This variation shows that controlling e6 is more important than activating the bishop. Therefore Alekhin played **41...Re8** and eventually won.

"Base your Analysis on Target Squares and hidden goals."

From this example we see the two-way connection between goal setting and analysis. For the purposes of his analysis, Alekhin assumed that each player would attack the opponent's king. This was a reasonable starting point, because both kings were exposed. He undoubtedly realized at the beginning that he might have to make a move to defend his king, but to find the right move he needed to trace the course of the opponent's attack. The goal of attacking the kings limited the possibilities sufficiently for a deep analysis. The weakness of e6 so revealed led him to set the goal of guarding it, which he was able to accomplish immediately. Thus, goals shaped his analysis, and the analysis in turn prompted an additional goal.

A static appraisal of the original position wouldn't suggest that e6 needed further protection. Of course, the activation of the rook by **41...Re8** might have been chosen on general principles, but so might several other moves. Only by concrete analysis could the crucial square by pinpointed.

In this position, the same method

MIESES vs. Alekhin (Scheveningen 1913)

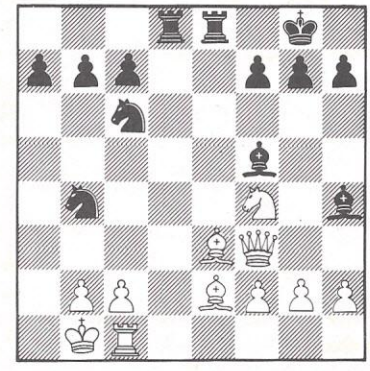


Diagram 3. Position after 17. Rc1

revealed a subtle trap. Black sees combinative possibilities in **17...Nxc2 18 Rxc2 Nb4,** since the rook seems hard to defend. For example: **19 Bd1 Rxd1+, or 19 Bd3 Nxd3 20 Qh5 g6 21 Qxh4 Nb4.**

White can slip out, however, with **19 Nd3.** Then **19...Nxd3** is answered by **20 Qxf5.** Likewise, **19...Bxd3 20 Bxd3 Nxd3 21 Rxc7 and 19...Be4 20 Nxb4 Bxf3 21 Bxf3** are not good for black. The combination fails only because the bishop at f5 is unguarded. Therefore Alekhin played **17...g6,** deviously attacking the c pawn, but white saw the trap and replied **18 g4.**

Goals derived from possible future positions occur frequently in human play. By contrast, some programs derive no information at all from a variation except the evaluation of the final position. Other programs, such as those that use the killer heuristic, achieve a limited transfer of information between variations. The heuristic applies when most of the moves in a position can be refuted by the same "killer" move, as when a piece is en prise. The programs save such moves and try them first in subsequent variations.

Human players learn far more from the variations they consider. The early stages of analysis provide insights that guide the later stages. The examples just given barely hint at the variety of insights so gained. For example, analysis may demonstrate the immobility of a piece or reveal hidden effects of a move. It often suggests possibilities to be alert for as play proceeds. The learning that goes on during anlysis is one of the most striking differences between human and computer play. *(Part II, next month)*

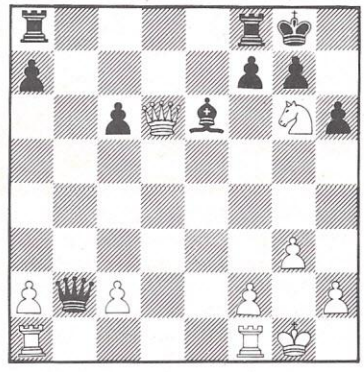
BORIS 2.5 Sparkles

The big debate these days is which microchess program is the better one: BORIS 2.5 or MYCHESS. Documented arguments are coming from both directions. In the following game, played earlier this year at the San Jose City College Open, BORIS 2.5 was the victor. Another game between these two protagonists will show where MYCHESS has won. The BORIS win is analyzed here by Morris Miller.

BORIS 2.5 vs Mychess

1. N-KB3	P-Q4	10. NxP	Q-B4
2. P-KN3	N-KB3	11. NxB	PxN
3. B-N2	N-B3 (a)	12. N-R4 (c)	Q-QN4
4. P-Q4	P-K3	13. P-Q5	PxP
5. N-B3 (b)	B-Q3	14. BxP	QxP
6. 0-0	0-0	15. BxN	PxB
7. B-N5	P-KR3	16. QxP	B-K3
8. BxN	QxB	17. N-N6 (d)	(Diagram)
9. P-K4	PxP	. . .	R (R1)-Q1?
		18. QxP	PxN?
		19. QxBch	K-R2
		20. Q-N3	R-QN1
		21. QxQ	RxQ
		22. R (KB1)-B1	R-B3 (e)
		23. R (R1)-N1	RxRP
		24. R-R1	R(B3)-R3? (f)
		25. RxR	RxR
		26. P-QB4	P-QR4
		27. P-B5	P-R5
		28. P-B6	R-K7
		29. P-B7	R-K1
		30. P-B8=Q	Resigns

BORIS 2.5 vs. MYCHESS



Position after White's 17th Move.

Notes to BORIS 2.5 vs MYCHESS

(a) It is refreshing to see that more openings have been fed into BORIS but here the text move should be replaced by 3-. . .P-Ba4.

(b) A similar mistake. Since white should strive to open up the line of its fianchettoed bishop against the center P-QB4 is required.

Perhaps what is needed is to program long range goals for the opening as well as specific lines of play. Some years ago Dr. Reuben Fine wrote a remarkable book, "The Ideas Behind The Chess Openings" advocating this idea (for humans!) but it applies to programs as well.

(c) Now white should play R-K; Q-Q2, with P-QB4 and P-Q5 in the offing. If the text is played it should be with a view toward an eventual P-KB4 to restrain the black king pawn. There is no hurry to play P-Q5 since if black attempts to prevent it white will have other initiatives.

(d) The long striding bishop is always better in an open position, so BORIS does best to seek complications. Black should play 17-. . .KR-Q1; 18-QxP, BxP; 19-N-B4, QR-B1; 20-Q-R4, RxP; (not 20-Q-R6, B-B5); 21-QxP, R(Q1)-Q7 etc.

(e) Black misses a drawing chance: 22-. . .R-QB1; 23-P—QB4, R-KB1; 24-P-KB4, P-N4!; 25-PxP, R(KB1)-B7 with a perpetual check. Or 24-R-KB1, R-QB7; 25-R(QR1)-B1, R(B1)xP etc.

(f) Much better is 24-. . .RxR; 25-RxR, R-B3; 26-R-B1, P-N4 and K-N3 etc. Black gains a move in this line since white's rook has to be behind the passed pawn.

The battle of Boris 2.5 vs Sargon 2.5

Many letters from our readers have led us to query both the Chafitz Co., and Applied Concepts as to the current situation of the BORIS/SARGON confusion. Letters were sent to both companies, but as of the August issue, only Applied Concepts had replied. The following letter was sent on June 18, 1980 to Steve Chafitz of Chafitz Company: "Enclosed is a photostat of the statement that Jim Morgan of Applied Concepts has sent us. It is scheduled to appear in the August issue of *Personal Computing*. Hopefully a response from you will clear up a lot of questions now being asked and will also indicate the future direction of Chafitz." No reply was received from Steve Chafitz until August 18, 1980, after publication of the Applied Concepts statement. At that time we received the following note: "Recent articles in your July and August issues are misleading. The article implies that the product (Modular Game System) is new to the marketplace. It is. . .the exact same product. . .as the Chafitz Modular Game System. . . .Chafitz is the owner of all proprietary rights to the Modular Game System and Chafitz introduced this product in January 1979. Currently we are in litigation with Applied Concepts regarding our contractual disputes. I feel that the articles created considerable confusion, do not accurately present obvious facts and more disappointing they do little in aiding the growth of a market Chafitz has dedicated so much effort to: electronic chess. Sincerely, Steve Chafitz." Steve Chafitz certainly deserves a lot of praise for his untiring efforts in promoting "stand-alone" chess-playing computers. We are sorry he saw fit not to respond to the Applied Concepts' story until after it was in print.

Classifieds

Rates for advertising in this section: $1 per word. Minimum. 15 words. Allow two months for appearance (usual publication lag). Announcement of human tournaments that are open to computers published without charge. Send all submissions for this section to COMPUTER CHESS CLASSIFIED DEPARTMENT.

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Gomoku – A Tournament Game

BY MICHAEL T. COMPTON
Five Stones Software, Ottawa

I recently described the ideas I used in programming Gomoku, and some combinations to give you an impression of how such ideas are put into practice. Description of a full tournament game will give you an idea of what is involved in the different stages of the game.

I would suggest that readers use 1/4" squared paper, and mark the vertical coordinate with numbers from 1 to 19 and the horizontal coordinate with letters from A to T, (notice no letter I). This is the easiest way to follow the action, marking x for black (who goes first) and O for white (memory aid — the O looks like a white stone).

At the 1980 North American tournament my program was playing black on a North Star computer using CP/M. Ed Johnson of the University of North Carolina was playing white on a PDP/10. My program played in a hair raising yet (under analysis) safe way to eventually win, by giving white enough rope to hang himself.

The first nine moves were from book —

1. K10	**2. J9**
3. K8	**4. K9**
5. M10	**6. L9**
7. M9	**8. L10**
9. L11	

leading to figure 1. This opening is designed to take advantage of another program's predisposition to attack whenever possible, creating a position where white is blocked in while black is on the outside with open 2's that can link up. I had played the first 8 moves

News on "Intelligent" Games of Backgammon, Checkers, Gomoku, Go, etc., welcomed by this department. Computer Chess and Computer Bridge appear separately. Address all correspondence to Computer Games Dept., Personal Computing.

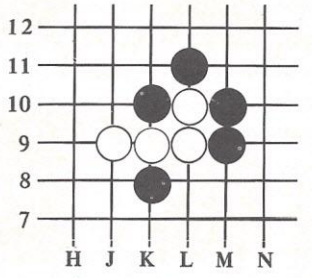


Fig. 1. Position after 9th move

before in competition, losing one by playing L8, and winning two games slowly by playing M8 in 1976. I analyzed the board position and determined that L11 was best, expecting K12 from white.

As we go through the next few moves, the tenor of the game is set by move 15, where black blocks a possible four on the L-file and sets up two two's, and then move 19 where black chooses a block that again builds his own strength at the bottom of the board (figure 2). This can be dangerous since black is now correspondingly weak at the upper left — move 19 dares white to find a win and certainly sharpened the tension in the game as I watched it progress.

	10. M11
11. J8	**12. L8**
13. N9	**14. O8**
15. L6	**16. H9**
17. G9	**18. J10**
19. M7	

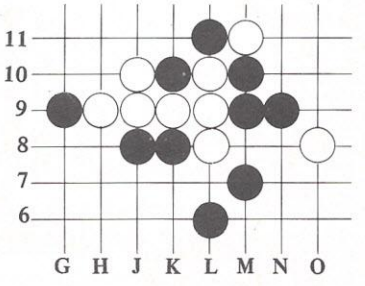


Fig. 2. Position after 19th move

In the next couple of moves black ups the ante by making the less safe block (if he can take the tension, I can).

	20. K11
21. G8	

We now go through a short phase where any analyst can be sure his program played perfectly, because the opponent's moves all created fours.

	22. N12
23. O13	**24. G12**
25. G11	**26. L12**
27. M13	

Move 28 is not a four, but the response is forced, because if 28. M12 then white plays 30. J12, 32. H13, 34. J14 winning.

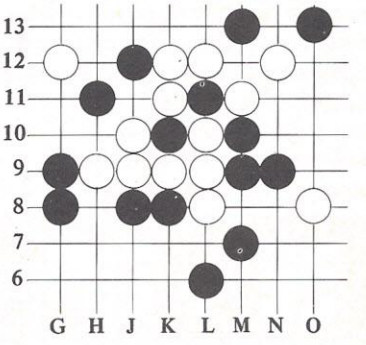


Fig. 3. Position after 29th move

	28. K12
29. J12	**30. K13**
31. J14	

(threatens 32. J14, 34. K15)

Now a couple more fours, and we reach a position where white is clearly lost.

	32. O9
33. N10	**34. M12**
35. O12	

We are now at figure 4, where black has lots of threats:

A. K14, threatening M14 then N13 or J13 then H12 then H14
B. M8 then H8 then K6
C. K5 then H7, then G7, then J7 and finally H8

White now kills one threat, only to set up another (J15, L15, N13 - 2 3's).

	36. K14
37. K15	

White retains the initiative for a while but by move 43, black has come one move closer at the top.

	38. O10
39. O7	**40. N11**
41. L13	**42. N8**
43. M3	**44. P13**

Black could have continued the win-

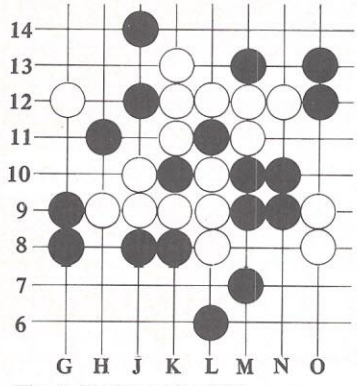


Fig. 4. Position after 35th move

ning sequence at the top, but instead started on a win at the bottom. Note the possibility of P8(4) then Q8(4 & 4). Most of the time such a sequence would be a win, but in this case there was no danger because P8 would be followed by M8 which is a four and must be blocked. So if white had played P8 instead of blocking a three, it would lose.

45. L7	**46. Q8(4)**
47. P9	**48. P8(4)**
49. R8	**50. P7**

Black now has the initiative again and starts a win at the bottom, with 51. M6, then plays a move which neither speeds things up nor lets white off the hook.

51. M6	**52. M8**
53. R9	**54. J6**

We are now at move 55 where you should be able to follow black's forcing 9-ply coup de grace.

55. K7	**56. N7**
57. J7	**58. H7**
59. H8	**60. F8**
61. K6	**62. L5**

63. F10, making a five and winning the game.

A number of things are apparent in this game — the most obvious being that it is difficult to tell a program that it is in danger when it can delay the inevitable for some length of time. By the same token it is not going to be possible to analyze openings in Gomoku by leaving the program with a deep search that will cook for a few days. A lost position can be a long time in the losing and you would need maybe forty plies

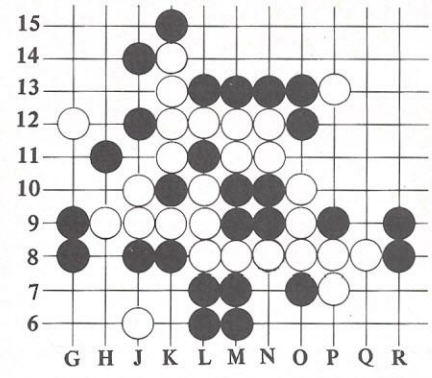


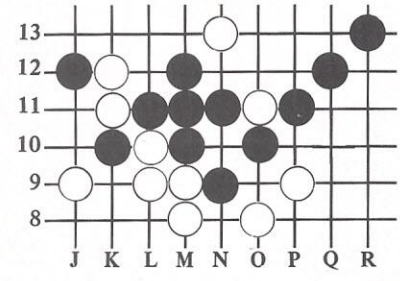
Fig 5. Position after 54th move

to deal with this kind of loss (assuming also that you could hit on all the right key moves which is unlikely). That leads us then to the conclusion that if it isn't possible to find the right moves in an unknown opening with an ocean of time, it certainly isn't possible to be surefooted with the alloted time in over the board play. The openings should become known by being played and the key moves then recorded in the program's book.

European Tournament

The European Gomoku Tournament was held April 11 to 15. Torsten Bille swept all six of his games to claim first place and the championship title for Europe. Joszef Janos, with a 3-3 score, came in second. One of Janos' two games with Bille is shown. Game comments are by Dr. Shein Wang ("W") and Bille ("B").

BILLE (Black)	vs JANOS (White)
1. K10	2. L9
3. L11	4. J9
5. M11	6. K11
7. M10	8. L10
9. N9	10. 08
11. M12	12. M9
13. J12	14. K12
15. N11	16. N13
17. O10	18. P9
19. P11	20. O11
21. Q12	22. M8
23. R13 (Wins)	



CHAMPIONSHIP FINISH

Dr. Wang reports that the North American current ladder standing is:

1. Ed Johnson and Arthur Coston
2. Mike Compton
3. John Day
4. Shein Wang and Ed Slodysko
5. Joel Smith
6. Jerry Crouch
7. Dan Kok
8. Dick Jensen

Any Gomoku reader interested in challenging a program on the ladder, should contact Dr. Shein Wang for information. His current summer address is 1108 6th Street, Golden, CO 80401.

GAME TALK:

B: "The opening to this point (8th move) is rather traditional. White should play 8. White should play 8. M9 instead of L10. It gives him better possibilities."

W: "No. I think 8. M12 is much better defensively. Look what happened to Johnson/Coston in a similar position in a later game when they played M9. You must be kidding."'

B: "Black at once starts his attack. At 13. J12 he blocks White without any letup in his attack. 14. K12 is forced. Then, 15. N11! threatens in all directions (17. N12, 19. M13, 21. O11; or 17. O10, 19. P11; or 17. L13, 19. M13, 21. N13) and wins."

W: "What if at move 14 White moves to N12, and threatens to make (4-3) at H9. If 15. M13, 16. M14, 17. N11, then White responding with 18. N8, 19. O7, 20. O10, 21. N13, 22. O14, 23. N12, 24. N10, 25. O11 (4-3) is still a win for Black. But White puts up a much harder fight.

Bridge on the TRS-80 and TI-99/4

BY THOMAS A. THROOP

As I mentioned last month, I am developing two bridge products for personal home computers with two members of the Dallas Aces bridge team, the world's most successful bridge team over the past several years. Both products are expected to be available at Christmas or very shortly thereafter.

These bridge products are for the TRS-80 and the Texas Instruments computers. The TRS-80 product is one which I am developing with Bob Hamman of the Dallas Aces.

The TRS-80 program is a playing program with two available options. First, the computer can generate thousands of bridge deals, using a pseudo random number routine which permits at any time the regeneration of a given deal. Then, as South, you play the North and South cards as the declarer at a contract the computer suggests or one of your choice, while the computer defends with the East and West cards.

You may play a deal seeing only the North-South cards from the beginning, as if you are playing at the bridge table. Or, you may play a deal seeing all four hands from the beginning, as when reading your favorite newspaper bridge column and planning your play.

You may also enter into the TRS-80 a deal of your choosing. Then, as before, you will play the North and South cards while the computer defends the East and West cards.

The second principal option you have is to play one of a number of selected deals in an instructional mode. Each time it is your turn to play one of the N-S cards you will be given three chances to come up with the best or recommended play. If you do not select this play in three choices, the computer program will tell you what this play is, and you may continue with the play of the deal. A booklet accompanying the computer program cassette discusses each of the instructional deals.

Let's look at a couple of deals generated by the pseudo random number routine and see how the computer defends while we play the N-S cards. In these examples the computer's defensive play is that as of the time this column was written.

The first deal to discuss is number 92. The contract suggested by the TRS-80 computer program is 2 hearts, which is perfectly acceptable. Your cards and those of the dummy are as follows:

NORTH
(Dummy)
♠ J64
♥ T76
♦ AQJT
♣ Q82

SOUTH
(Declarer)
♠ A82
♥ KQ543
♦ K64
♣ 95

When the cards are originally dealt by the TRS-80 for this deal, the hands are reversed from that shown. However, you have the option of reversing the North-South cards in order to have the more logical declarer be South. When the North-South cards are switched, the East-West cards are also switched to preserve the original relationship of the four hands. In this deal South is the more logical declarer, having the five hearts versus three in the other hand.

The TRS-80, as West, opens the king of spades against your 2 heart contract. You play the 4 from dummy, and East plays a higher spade, the ten, as a signal to West (assuming that the ten is not a singleton). The signal indicates the ace or queen of spades, a doubleton in that suit, or some other reason for West to continue that suit.

On this deal it is proper to go after the enemy trumps right away, since you do not need to plan to ruff any losers in dummy first. Wishing to hold your trump losers to one trick, you should hope that East has the ace of hearts or that the jack of hearts is a doubleton.

Suppose that you win the first trick with the ace of spades. What is your next play? You should lead a diamond to dummy's ten and then lead a heart from dummy up to your KQ. On the heart lead East plays the ace, you play small, and West follows with the 8.

Now, at trick 4, East leads the king of clubs, showing his AK holding as will become evident. You play the 5 from South, West follows with the 3, you play the deuce from dummy. West's play shows that he does not have a doubleton club, unless it is a doubleton jack. East now completes his high-low signal in spades by leading the 3 of spades to West's indicated queen. West wins with the queen and then switches to the jack of clubs in order to trap dummy's queen of clubs.

Suppose that you now play the 8 of clubs from dummy. East plays the 4 and you play the 9 from your hand. Next, West leads the 5 of spades to give East a ruff. East ruffs with the deuce of hearts. At trick 8, East leads the ace of clubs which you win with the 4 of trumps. The king of hearts draws the outstanding enemy trumps and the rest of the tricks are easily yours, as you make exactly 2 hearts. The computer's defense was very strong, winning all of the tricks it possibly could.

NORTH
(Dummy)
♠ J64
♥ T76
♦ AQJT
♣ Q82

COMPUTER
WEST
♠ KQ975
♥ 98
♦ 983
♣ JT3

COMPUTER
EAST
♠ T3
♥ AJ2
♦ 752
♣ AK764

SOUTH
(Declarer)
♠ A82
♥ KQ543
♦ K64
♣ 95

		W	N	E	S
Trick	1	KS	4S	TS	AS
	2	3D	TD	2D	4D
	3	8H	6H	AH	3H
	4	3C	2C	KC	5C
	5	QS	6S	3S	2S
	6	JC	8C	4C	9C
	7	5S	JS	2H	8S
	8	TC	QC	AC	4H
	9	9H	7H	JH	KH
	10	8D	QD	5D	KD
	11	9D	AD	7D	6D
	12	7S	TH	6C	5H
	13	9S	JD	7C	QH

Continued on pg. 90

Contract: 2 hearts
Tricks N-S: 8 Tricks E-W: 5

The next deal is number 207. The contract suggested by the TRS-80 program is 3 no-trump, which is quite reasonable. Your cards and those of the dummy are as follows:

NORTH
(Dummy)
♠ KT5
♥ AJ95
♦ AJ4
♣ 632

SOUTH
(Declarer)
♠ A642
♥ 64
♦ KQ75
♣ A85

The TRS-80, as West, opens the 4 of clubs against your 3 no-trump contract. You play the deuce from dummy, the TRS-80, as East, plays the queen, and you should play the 5 from your hand.

East continues with the ten of clubs, which you should also duck, West follows with the 7, and you play the 3 from dummy. East then leads the 9 of clubs, which you win with the ace, West following with the jack.

Now, how do you play this hand? You have two spades, one heart, four diamonds, and one club in top tricks. Your best chance for a ninth trick is to hope that West holds the ten and either the king or queen of hearts. Therefore, at trick 4 you should lead the 4 of hearts from your hand. West plays the 3, you should play the 9 from dummy as planned, and East wins with the queen.

East returns the 7 of spades. Now you must be careful. If you plan on winning this trick in dummy with the king, you will create some problems. You will not have a good way to get to your hand to repeat the heart finesse. If you come to your hand immediately with the king or queen of diamonds, and the heart finesse loses and East elects to return another spade, you will have to win in your hand with the ace. After entering dummy with the ace of diamonds and cashing the ace of hearts, your only hope for two more diamond tricks will be that the diamonds were initially divided 3-3. Then, when you lead the jack of diamonds from dummy and overtake it with your remaining honor, your fourth diamond will be good. If you avoid these problems in the diamond suit by playing the ace, jack and a small diamond to your hand for the heart finesse, then you will have no entry to dummy to cash the ace of hearts if the heart finesse loses.

Therefore, on East's return of the 7 of spades at trick 5 you should win with the ace in your hand. Now, at trick 6, you lead the 6 of hearts from your hand, West plays the 8 and you finesse with the jack in dummy, on which East plays the 5. Now you have your ninth trick.

When you play out the rest of the deal, the TRS-80 computer program should defend carefully enough to prevent you from making an overtrick. When you have this cassette in the computer, why not play the deal for yourself and see how the computer program defends!

The complete deal, the play of the cards described for the first six tricks, and one sequence of plays for the last seven tricks are:

NORTH
(Dummy)
♠ KT5
♥ AJ92
♦ AJ4
♣ 632

COMPUTER WEST
♠ Q
♥ KT83
♦ 9632
♣ KJ74

COMPUTER EAST
♠ J9873
♥ Q75
♦ T8
♣ QT9

SOUTH
(Declarer)
♠ A642
♥ 64
♦ KQ75
♣ A85

	W	N	E	S
Trick 1	4C	2C	QC	5C
2	7C	3C	TC	8C
3	JC	6C	9C	AC
4	3H	9H	QH	4H
5	QS	5S	7S	AS
6	8H	JH	5H	6H
7	2D	AD	8D	5D
8	3D	JD	TD	7D
9	6D	4D	3S	KD
10	9D	2H	8S	QD
11	KC	KS	9S	2S
12	TH	AH	7H	4S
13	KH	TS	JS	6S

Contract: 3 no-trump
Tricks N-S: 9 Tricks E-W: 4

The Texas Instruments 99/4 product is one which I am developing with Bobby Wolff of the Dallas Aces.

The TI 99/4 program is a bidding program. As South, you select the bids with your cards while the computer provides the bids for your partner, North, and your East-West opponents. Each time it is your turn to bid you have three chances to come up with the best or recommended bid. If you do not select this bid in three choices, the computer program will tell you what is the preferred bid, as well as providing you with an explanation of this bid, bids by your partner, and bids by East-West. Also, explanations of certain bidding conventions may be displayed on request. This product will help improve your bidding.

Next month I shall present some more examples of both the TRS-80 playing program, including at least one deal played in the instructional mode, and the TI 99/4 bidding program. Also, I'll report on some additional details for both of these products.

Are You Computer Literate?

Are You Computer Literate?, by Karen Billings and David Moursund; dilithium Press, P.O. Box 92, Forest Grove, OR 97116; 148 pp.; $6.95 paperback.

Many leaders in the field of computer science advocate organized study of the capabilities, limitations and applications of computers at least on an introductory level. *Are You Computer Literate?* by Karen Billings and David Moursund is designed to help you become more familiar with the ever-changing world of computers.

Assuming you have no previous knowledge or experience with computers, the authors take a step-by-step approach to computer education. The book can be used as an aid to instruction in a classroom or as a self-instruction tool and is written clearly, allowing high school students as well as college professors to benefit from reading it.

Particularly suited to self-instruction, the book contains quizzes at the beginning of seven of its chapters and a final exam at the conclusion, allowing you to chart your progress and your knowledge. Other educational tools, fill-in-the-blank and matching exercises, test reading and retention skills.

Although Billings and Moursund never claim to teach you everything about computers in one book, they try to provide background to at least head you in the right direction. They use familiar computer applications such as banking, retailing and law enforcement to illustrate the many ways computers are used in today's society. They also prompt questions in the student's mind such as how much control the government should have in the collection of data made easier by computers, who should have access to computer collected data and how this information should be used.

"What is a Computer?", Chapter 2, discusses general functions a computer can perform: data processing, problem solving, executing programs and output of answers. The authors also deal with computer limitations, memory and speed. "A fast modern computer can do more arithmetic in one minute than a person using a pencil and paper could do in a lifetime."

Evolution of the computer from the abacus through the present day computer is described, including the mechanical calculator, the Jacquard loom, analytical engine, relay computers and the electronic digital computer. The U.S. Census of 1890 is also discussed as an important step toward the development of punched data cards by Herman Hollerith, whose company is now part of IBM.

Data entry and computer programming are discussed next. The authors define data as "information to be processed by a computer" and describe the many ways it can be input to a computer: key to tape, key to disk, mark sense readers, magnetic ink, optical character recognition, universal product code, voice input and sensing devices. A computer program is defined as "a detailed, step by step set of directions telling a computer exactly how to solve a certain kind of problem."

Requirements for smart machines are described in Chapter 5: "1) It must have some sort of measuring or sensing device in order to receive input from the outside world, 2) It must be able to use the data it receives, 3) It must be able to act upon the outside world." The authors also provide two games in this chapter designed to teach the reader about robots.

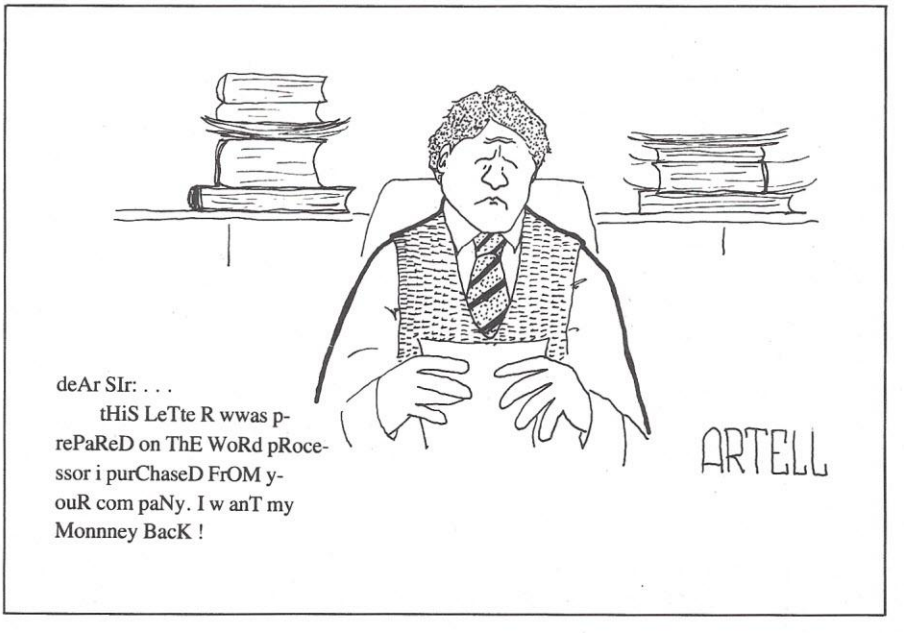
Chapter 6 examines mathematical modeling, computer simulation, information retrieval, data processing and other examples of how computers are used in many different applications such as business and education.

"As time goes on, computers will have a bigger and bigger impact upon people," the authors said. "This is bound to occur, because computers are versatile and useful machines. They are getting cheaper. And people are gaining more knowledge on how to use computers." The effect computers have on people is discussed in the context of the goods and services they provide, the jobs they create as well as eliminate and the ways computers are used in education.

Billings and Moursund deal with the question of what educational institutions should do to prepare students for life in a computerized society. "First, teachers need to understand how computers affect the subject matter they teach. They can then teach something about computers when it is an important part of their subject matter." Their second solution requires joint work by students and the schools.

"The goal of this book is to increase your level of computer literacy. We want you to know more about what computers can do, and what they cannot do. We want you to be aware of the problems computers create for our educational system, government, and you," conclude the authors.

— Reviewed by Elli Holman



WHAT'S COMING UP

SOFTWARE

Computer-Aided Scheduling for TRS-80 and Apple II

Project Schedule Analysis/1 is a cassette-based introduction to computer-aided scheduling for the TRS-80 Level II and Apple II computers with floating point Basic and at least 16K of memory. PSA/1 uses critical-path scheduling techniques similar to those used by NASA for the U.S. space program.

PSA/1 computes schedules for each job within a project; these schedules show how early each job can be started, how early it can be finished and the latest each job can be started and finished and still meet a project deadline. Schedules also show how long each job can be delayed without affecting other jobs. Once defined, projects can be named and their data stored on tape for later analysis. Flexibility is enhanced by allowing you to specify any time unit (hours, days, weeks) desired for tracking the project.

Schedule results are displayed on the video monitor, and printed reports can be produced if you have a line printer capable of printing 80 columns or more. Apple owners must provide their own printer driver routines at locations indicated in the software.

The accompanying User Manual provides over 50 pages of information including how to define project networks, how to make time estimates and how to operate each of the six functions in the PSA/1 to such applications as building a house, planning a new product and preparing a gourmet dinner.

The PSA/1 package consists of the program cassette and User Manual, and is available for $25 postpaid. Order should specify the TRS-80 or Apple II version. Washington residents should add $1.25 sales tax; Canadian orders should be paid in U.S. funds. For more information contact Express Marketing, P.O. Box 1736/BWC, Poulsbo, WA 98370; (206) 779-9508. *Circle 103*

Elementary Math Package

Compak, Inc., has announced a Mathematics Package (grades 1 to 8) for the 32K Apple II and TI 99/4 microcomputers.

The package is designed to support mathematics instruction and improve student achievement. Some instructional materials can be used for review and practice while other materials are designed to introduce and develop mathematical ideas.

Ten major concepts are covered by the package and it includes over five hundred different self-contained modules. The concept areas include: Addition, Subtraction, Multiplication, Division, Common Fractions, Decimal Fractions, Percents, Measurements, Geometry and Elementary Algebra.

Instruction is individualized so students can move at their own pace. Each concept area contains multiple levels that range from easy to difficult. As students progress within the program, they automatically branch to the appropriate level of difficulty based on their performance score.

The Mathematics Package provides a student recordkeeping feature which allows the teacher to keep track of student progress. At the end of a lesson, the screen displays the number of problems attempted, the number correct on the first try, the number missed, the percent correct and any promotions or demotions. This same information is also automatically recorded on the teacher's "gradebook" disk. A special "gradebook" program enables the teacher to print names, add names, delete names, print scores and change scores. The printing of names and scores may be done individually or by class and on a printer if one is available.

Unique features of the programs include: an escape function which allows students to end the lesson and still retain their score; the capability to erase an answer before completing it; the capability to enter answers in the same direction as they are worked on paper (i.e. right to left for multiplication), and the effective use of attractive color graphics and sound to provide immediate student reinforcement.

The complete Mathematics Package contains ten instructional disks and one recordkeeping disk in a binder with a teacher's manual. The programs can be ordered by the complete package for $495; by all concepts for a single grade level (i.e. the disk for Grade 7 with all ten concepts) for $65; or by one concept for all grade levels (i.e. the concept Addition for all eight grades) for $50. A sample disk is available for $35 as is the Teacher's Guide Manual for $20. For further information contact Compak, Inc., P.O. Box 14852, Austin, TX 78761; (512) 452-1680. *Circle No. 116*

Configurable Business System Features Transaction Processing

Lifeboat Associates announced The Configurable Business System (CBS), a data management system that allows true transaction processing. Custom accounting systems for payables, receivables, inventory control, order entry and general ledger can be set up without using any programming languages.

CBS defines an application such as an inventory control system by specifying master files to describe the inventory, customer and vendor files. Transaction files describe activities such as purchases and sales. A data entry program enters information about customers, vendors, inventory, sales and purchases. After data entry is complete, an update program can process the transactions against the various master files, updating account balances and inventory quantities.

The system features a comprehensive report generator which produces invoices, purchase orders, re-order reports, mailing labels or other special reports specific to the application.

CBS requires a CP/M compatible system and at least 48K of memory. It does not require any support languages and is priced at $295. Documentation and a demonstration inventory system are supplied. For more information contact Lifeboat Associates, 2248 Broadway, New York, NY 10024; (212) 580-0082. *Circle 129*

Integrated Business Application Software

North Star Computers, Inc. has added integrated business application software packages to its product line. These new packages, designed for use with North Star's Horizon computer system, include General Ledger, Accounts Receivable and Accounts Payable.

Authorized North Star dealers can provide business customers with both hardware and integrated application software from the same source. A complete small business system including a Horizon computer with two quad-capacity drives and 64K RAM, CRT display terminal, letter-quality printer, NorthWord word processor, Mail Manager and General Ledger application software would cost under $10,000.

These business software packages are written with the first-time user in mind and are fully integrated. Each package can stand alone, or be used in combination with other packages to perform an even greater variety of tasks.

General Ledger package includes a financial reporting feature and is the cornerstone of the new business software. General Ledger is a complete program that allows you to maintain general ledger accounts based on inputs such as checks, bank deposits and journal entries. The financial reporting feature allows you to define dollar precision, use multiple columns, define sub- and grand-totaling and carry totals forward to other statements. General Ledger can be used in combination with NorthWord word processor to produce additional customized financial statements and reports. Accounting entries can be transferred from General Ledger to the other North Star business software packages, Accounts Receivable and Accounts Payable.

The Accounts Receivable package allows you to establish and maintain up to 1500 customer accounts. It has features for retaining credit limits, year-to-date sales, last year's sales, date and amount of last invoice and payment, and number of outstanding transactions for each account. It can be used as a stand-alone program or combined with General Ledger and Accounts Payable as a complete business accounting system.

Accounts Payable allows you to establish and maintain up to 1500 vendor accounts, and includes flexible controls for printing checks, remittance notices and reports. Accounting distributions from Accounts Payable can be transferred automatically to General Ledger.

Each application software package has been completely tested in actual business use and comes with professionally prepared instruction manuals. For further information contact your local North Star dealer or North Star Computers, 1440 Fourth St., Berkeley, CA 94710; (415) 527-6950.
Circle No. 123

TRS-80 Programs for Retailers

Two software packages for the TRS-80 Model I business computer system will assist effective management of small retail businesses. A Balance Forward Accounts Receivable program using reports modeled after manual pegboard systems keeps track of transactions each month on account (on-line credit check of account is included for balance verification). A Retail Inventory Control program keeps track of inventory and sales information on each of 99 departments. The Inventory program also retains last year's data for comparison.

System features for accounts receivable include: 1000 accounts per disk (up to 8 disks), daily control sheets, statements printed on preprinted forms, automatic computation of service charge on selected accounts, various customer balance and credit reports and on-line - credit limit inquiry.

Features of inventory control are: summary management report by department, sales analysis report, inventory on hand report, sales analysis by salesperson, tracks MTD and YTD sales, purchases, markdowns, initial markup percent and maintained markup percent by department number.

These programs are fully documented and have been in operation for over a year. Accounts Receivable sells for $200 and Inventory sells for $400. Both may be obtained for $500. For further information contact Data Processing Consultants, 304 S. Dunlap, Paris, TN 38242; (901) 642-8627.
Circle No. 127

Apple II Textwriter

Services Unique, Inc. announced the Disk Apple II Report Textwriter (Dart) software for the Apple II and Apple II Plus computers. Dart processing software was designed to simplify the creation of letters, reports and other output text utilizing disk files created by Edit.

This text composition system allows free form file input without regard to either line or page length. Dart assembles text into physical lines and pages using pre-defined operator or file parameters. A special feature allows variable data to be key entered at report generation time utilizing standard text or form letter. File chaining allows an unlimited amount of input text. Other options include pagination, line justification, titles-subtitles, page numbering, line centering, margin setting and double spacing.

Dart operates on an Apple II or Apple II Plus with a minimum of 32K memory, one disk unit and a printer. The textwriter supports a variety of printers including lower case as well as a CRT review. Optional lower case display is available with the appropriate adaptor.

A user manual with documentation is provided. Price is $19.95 on diskette (+$1.25 shipping); a special package price for Dart and the text editor (Edit-II) is $37.89. For more information contact Services Unique, Inc., 2441 Rolling View Dr., Dayton, OH 45431. *Circle No. 160*

More Sargon II

Sargon II is now available in both cassette and disk formats for TRS-80 Level II, Apple II (each $29.95); TRS-80 Level II Disk, Apple II Disk (each $34.95).

In the future Sargon II will be available for Pet, Sorcerer, HeathKit, Ohio Scientific and CP/M.

For more information contact Hayden Book Company, Inc., 50 Essex Street, Rochelle Park, NJ 07662.
Circle No. 110

Data Base Management System for Apple Computers

A file management system for storing, classifying, manipulating and retrieving data in the Apple II microcomputer has been announced by Rainbow Computing, Inc.

Called Filemaster II, the system is comprised of four Applesoft programs: File Designer, a step-by-step, menu-driven guide for developing the structure of the information; Search & Retrieval, for entering data and retrieving records by logical AND, OR, NOR and NAND searching; Sort Information, providing the required input for use with the Single Disk Sort by Datacope; and File Converter, a process for converting old Filemaster I files into the new Filemaster II format. These programs are designed to allow you considerable flexibility and control in the management of information, the company said.

Special features include: computed numeric fields from user-entered formulas, totaling of numeric fields from records retrieved in a search, tallying of a given class of records in a file, provisions for creating a sub-file onto a second disk, retrieval of both active and non-active records and output formatting and printer control. Special input routines, menu-driven programs, error trapping, and both in-program and hard copy documentation allow even computer novices to manipulate data files. Requires 48K, Applesoft ROM and a disk drive (two drives are required for disk to disk transfers).

Filemaster II is available for $99.50. For more information contact Rainbow Computing, Inc., Garden Plaza Shopping Center, 9719 Reseda Blvd., Northridge, CA 91324; (213) 349-5560. *Circle No. 139*

Master Accountant Business Software

Computer Services announced Master Accountant Business System for CP/M compatible microcomputer systems.

Master Accountant Payroll System allows a company to prepare its periodic payroll for hourly, salaried and commissioned employees while accumulating the necessary information for tax reporting. It generates the monthly, quarterly and annual returns to be filed with local, state and federal governments. It also prepares employees' W-2s and maintains an up-to-date information reference for each employee.

The Payroll System includes tables for federal withholding and FICA as well as withholdings for any of the fifty states and up to twenty localities from precomputed or user generated tables. The system will automatically produce payroll checks.

Each program contains a complete set of prompts and other helping messages that allow even an inexperienced operator to make full use of the system with minimal instructional time.

The Payroll System is designed to interface with the Master Accountant General Ledger System. This feature provides automatic monthly journal entries to the General Ledger. Also available to compliment the Payroll System are Accounts Receivable, Accounts Payable and General Ledger.

All of the Master Accountant software is written in Microsoft Disk Basic and is available on 8" soft sector diskettes. Each package sells for $100; the manuals separately for your review are $25 each and a special demo package with manual is $50 each. For more information contact Computer Services, P.O. Box 2292, Hickory, NC 28601; (704) 294-1616. *Circle No. 137*

Business Data Base for TRS-80

Charles Mann & Associates has announced a programmable Business Data Base System for the TRS-80 computer. The system allows you to define and build data bases for inventory control, general ledger accounting, accounts receivable and accounts payable. The fields may be manipulated with the exclusive CMA math formula accumulator to format reports and present status displays.

The system allows the filing of report formats for later use, and printing on most compatible printers. All data may be searched, sorted and displayed as needed. The system uses disk resident files and thus has a large capacity. The Data Base contains its own file catalog to make operation simple even for the non-computer user.

Data Base is compatible with TRSDOS, NEWDOS and 3.0 DOS. The programs are auto linked and called automatically as needed with full user driven menu control. The system needs 32K of RAM (48K recommended) and a single disk drive. Multiple disk systems are fully supported under user control.

The Business Data Base System is available from any of CMA's 650 dealers worldwide for $89.95. Additional information and dealer locations are available from Charles Mann & Associates, Consumer Products Division, 7594 San Remo Trail, Yucca Valley, CA 92284; (714) 365-9718. *Circle No. 141*

Apple Plot Generates Charts and Graphics

A software package enabling users of Apple personal computers to create, revise and print detailed charts and graphs was introduced by Apple Computer Inc.

The program, Apple Plot, gives educators and business users plotting capability previously found only on more expensive minicomputers and calculator systems.

When used with a color television monitor, Apple Plot helps you understand the information being plotted by displaying it in various colors. Hard copies of graphs and charts can be made automatically via an optional printer.

Apple Plot gives you a choice of six graphic formats: line, multiline, bar, multibar, bar with line overlay and scattergraph. Information can be entered manually, through the computer keyboard or from an external program such as VisiCalc or Desktop Plan.

The program offers entry, edit and graph manipulation capabilities. It allows you to label axes and plots, automatically changes the range scale and lets you change the graph parameters or expand selected graph areas when greater detail is required.

Apple Plot will run on 48K Apple II Plus, on a 48K Apple

II with an Applesoft II firmware card or on either machine with an Apple Language System. Also required are: an Apple Disk II with controller, a video monitor or television set and, for hard copy, a compatible printer with controller card.

With purchase of Apple Plot, the user receives a write-protected Apple Plot diskette and an instruction manual. Apple Plot retails for $70. For more information contact Apple Computer, Inc., 10260 Bandley Dr., Cupertino, CA 95014; (408) 998-1010. *Circle No. 101*

Office Appointment Calendar Program

Datebook manages time in a similar manner to the common office appointment book but with the speed and accuracy of a computer. It maintains a record of appointments for up to three people (or three rooms) for an unlimited time in the future. Datebook is ideal for doctors, dentists, lawyers, salesmen, repairmen, or in any situation where time management is critical to office efficiency.

Datebook was written for use by people with no computer background at all. It is easy to learn but still fast and efficient for an experienced professional, the company said. All operator entries are checked for validity as they are entered in order to eliminate errors. The appointment data is stored on disk and a condensed calendar is kept in memory for fast access to the limited information needed for searching for appointment openings.

The operator works from a main option menu that appears at the bottom of a display of the day's appointments. Menu items include: appointments, scheduling, cancelling, modifying and rescheduling; searching for all appointments for a specified person; scanning for openings that satisfy a set of arbitrary constraints; inspecting appointments for days in the future; and printing a day's appointments.

Appointment openings are found at computer speed eliminating the frustrating and time consuming chore of paging through a book searching for an opening to fit a client's request, the company said.

Datebook finds openings that fit time of day, day of week and day of year constraints. It eliminates the disadvantages of a paper appointment book. Appointments are modified or cancelled with only a few key strokes. Clean copies of a day's appointments can be printed for each office worker or saved as a permanent record.

Datebook was written in Pascal and is available to run on CP/M and its derivatives, as well as USCD Pascal systems. It is available for immediate delivery and is priced at $295. For more information contact Organic Software, 1492 Windsor Way, Livermore, CA 94550; (415) 455-4034.
Circle No. 100

Machine Language TRS-80 Game

Polysonic Breakout, from Savage Enterprises, has over 100,000 different sound, speed and brick combinations. It includes seven different brick patterns, seven different game speeds, numerous sound variations and continuous keyboard scanning.

Each brick pattern consists of four rows and you may change the pattern every game. As you increase the speed of the ball the speed of the paddle is increased accordingly.

Sound selection allows you to choose any of 343 different sound combinations so you can custom design sounds by touching a button.

The paddle is operated on keyboard by the right and left arrow keys. It is on the bottom of the game instead of the side because the TRS-80 graphic set-up enables many more ball directions, the company said.

Included are written instructions and explanations on the tape. Game is complete with speaker and connections for $15.95 (MN residents add 4% sales tax). For more information contact Savage Enterprises, P.O. Box 12, Brainerd, MN 56401. *Circle No. 106*

Real Estate Analyzer for Apple

A software package for Apple computers takes the guesswork out of real estate investing for professionals and individuals alike, Howard Software said. This package helps you make intelligent buy and sell decisions by computing the true net cash flows and annualized after-sale return-on-investment for any property you define.

The software allows you to view the direct impact of loan terms, tax bracket, depreciation schedule and holding period, as well as the separate inflation rates for rents, property values, expenses and taxes.

All information is itemized in tabular form on the video screen or a line printer, year-by-year for the ten years after purchase. Use with a disk unit also allows you to file, retrieve and alter information on your properties.

Real Estate Analyzer by Howardsoft is available on disk or tape for Apple computers with 48K and Applesoft at $49. Inquire at your dealer or contact Howard Software Services, 7722 Hosford Ave., Los Angeles, CA 90045. *Circle No. 109*

Mailing List Software

CDS Corporation announced the release of Mail List for the Commodore CBM 16K and 32K computers with CBM 2040 disk drives and CBM or ASCII printers. Mail List is a user-oriented program that prepares and organizes mailing list labels.

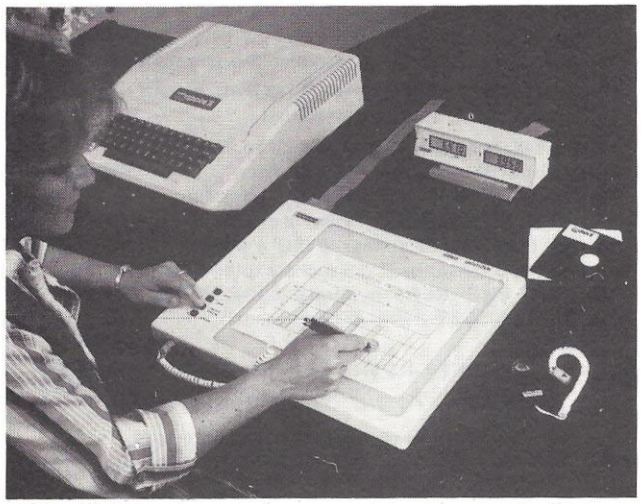
Besides storing a large number (1,050) of records on a single disk, another feature of Mail List is that the length of all fields can be adjusted by you. Mailing labels can be printed out according to alphabetical or zip code order. Records can be identified and selected as active or inactive records and according to a user-designated utility field.

The Mail List manual, which is over 30 pages, takes the novice (soon to be expert) through a step-by-step series of instructions. The price is $95 and Mail List is available from your computer dealer. For more information contact CDS Corporation, 695 East Tenth North, Logan, UT 84321; (801) 753-6990. *Circle No. 104*

PERIPHERALS

Digitizer for the Apple II

The DT-11A version of the Hi Pad digitizer provides a slot interface card for the Apple II, a floppy based software package, menu overlay and stylus. Functions supported by the software include Draw, Line, Area, Background, Pen Color, Separate, Catalog, Save, Load, Shape and so forth. A plastic overlay that serves as a menu allows you a selection of these functions and gives the user the opportunity to generate a wide variety of creative color graphics displays that may be manipulated.

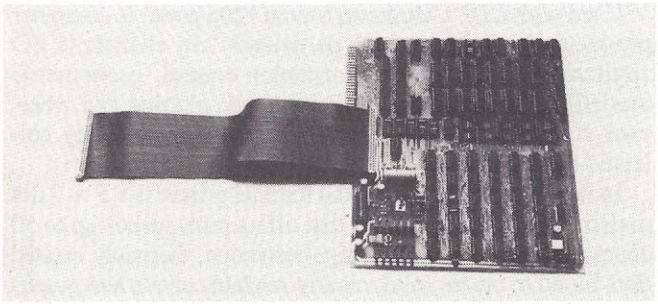


Besides the interface and software, the DT-11A offers slot independence, Basic and Pascal compatibility, assembler driver code, user controls and optional cursor. The DT-11A/Apple II system requires a 48K system and the Applesoft Firmware Card. No magnetic biasing is required, nor does the DT-11A suffer from extreme static sensitivity.

As an entire package, including Hi Pad digitizer, interface, software, overlay and stylus, the Hi Pad DT-11A is available for $795. For further details contact Houston Instrument, One Houston Square, Austin, TX 78753; (512) 837-2820. *Circle No. 140*

Pet Graphic Interface

A high resolution graphic display board for new or old Commodore Pet computers that provides video mixing and ROM sockets was introduced by Micro Technology Unlimited.



The MTU K-1008-6 Pet Graphic Interface provides software selectable Pet video, graphic video or both. The expansion board features five ROM sockets that can be set at the same or different addresses. The system is automatically restored to the user selected configuration after power-up or reset.

Mounted inside new or old Pet computers, the MTU K-1008-6 provides user control over a matrix of 64,000 dots (320 wide × 200 high). Serving as an 8K byte expansion memory when not used for graphics, the board also creates a KIM/MTU expansion bus supported by various MTU products. On-board expansion allows use with optional light pen; K-1008-3C graphic software is also offered.

The interface is priced at $320; K-1007-2 connector board for old Pet at $35; K-1007-3 connector board for new Pet at $59. Literature is available on request. For more information contact Micro Technology Unlimited, David B. Cox, 2806 Hillsborough St., P.O. Box 12106, Raleigh, NC 27605; (919) 833-1458. *Circle No. 126*

High-Resolution Portable Printer/Plotter Capability

Computer Devices, Inc. announced a high-resolution Miniterm portable printer/plotter. Available for immediate delivery, the plotting feature is optional with Computer Devices' Miniterm series of portable terminals and portable computers.

Capable of plotting up to 3420 dots per square inch (60 dots vertically by 57 dots horizontally) and achieving horizontal speeds of up to 24 inches per second between plotted points, the thermal matrix printer/plotter comes complete with CDI's switch-selectable 80/132 column alphanumeric printer feature. Other features include microprocessor control, a 45-character buffer, a full 96-character ASCII set of upper and lower case characters, and a patented print head control mechanism to provide long-life, quiet operation, extremely high reliability and applications flexibility, the company said.

The printer/plotter option is priced at $425. Miniterms with the 80/132 plotter option range in price from $2410 for the Model 1203 KSR portable data terminal to $5910 for the Miniterm 1206 portable computer models that are either self-prompting or programmable.

When using a portable Miniterm Model 1203 KSR, you can circumvent the delays inherent in time-sharing applications where graphic output is required. With the portable printer/plotter, graphs can be printed on the portable, remote terminal instead of at a central time-sharing computer location.

Used with CDI's Miniterm Model 1206 portable computer products, the graphics are a particularly key element in I/O applications such as instrumentation control, econometric modeling, financial and business trends plotting and wherever statistics, equations or tabular data are remotely collected or required.

In its non-graphic mode, the thermal printer is a 5 × 7 dot matrix, friction feed printer that offers print speeds up to 50 characters per second. The high-resolution, thermally created dots blend to create solid, clearly-readable charts and graphs because individual dots can be placed as close as 0.017 inches apart.

For further information contact Computer Devices, Inc., 25 North Ave., Burlington, MA 01803; (617) 273-1550. In Europe, CDI is located at 108 Place des Miroirs, 9100 Evry, France; (6) 079 0077. *Circle No. 115*

180 CPS Matrix Printer

Pacific Mountain States Corp. has announced the availability of a new 180 cps matrix printer that out-performs the TI-810 and Centronics 703/704 at a fraction of the price of those printers, the company said. The full-featured printer, the DS180 by Datasouth, has a single unit price of $1395.

The DS180 utilizes logic-seeking bidirectional printing at 180 cps to achieve extremely high throughput. Under microprocessor control, the printhead automatically takes the shortest path to the next printable character and slews at high speed over blank spaces in the text. The standard 1000 character buffer (optional 2000) and a choice of two handshaking protocols ensure optimum throughput on any CRT, business system or as a remote printer. Lab tests have shown the performance printing 40 column lines to be 198 lpm and at 10 columns 455 lpm, according to the company.

The 94 ASCII character set is printed in a 9-high by 7-wide dot matrix. True lower case descenders and simultaneous

underlining are possible because of the 9-wire printhead. An adjustable head-to-platen gap accommodates forms up to 6 parts in thickness. Fanfold perforated forms from 3 to 15 inches may be fed through the front or bottom of the printer. An optional floor stand with basket is also available. The DS180 comes standard with three interfaces: RS-232, current loop and an 8-bit parallel Centronics compatible.

The 38 programmable features of the DS180 may be configured from the control panel on the front of the printer or via the communications line. The LED indicators, digital display and custom keypad make format setup quick and simple, PMS said. A non-volatile memory retains the settings when power is turned off, eliminating the need to reconfigure the printer before its next use.

In order to utilize the high performance characteristics of the DS180 in CRT clusters, PMS offers an optional terminal multiplexer that allows up to four CRT's to share one printer. This mux, priced at $295, permits only one CRT at a time to use the printer when using select switch cables. The unit is code transparent and can operate from 75 to 19,200 baud.

For more information contact PMS, 6319-B DeSoto Ave., Woodland Hills, CA 91367; (213) 999-2281.
Circle No. 134

Bidirectional Dot Matrix Printer

Matchless Systems has added a 132/80 column printer to its product line. The MS-204 is a bidirectional, 9 × 7 dot matrix printer that utilizes a print mechanism of simple design and high reliability, resulting in a superior performance, the company said. It has a print head life of 100 million characters.

Among the other features are a print speed of 125 cps and a through-put print speed of 63 lpm. The adjustable sprocket feed mechanism allows use of forms from 2.5″ to 9.5″ wide with loading from either the bottom or rear. A full 96 ASCII set permits printing upper and lower case characters which can be expanded for double width fonts in bold face. The VFU (Vertical Format Unit) provides pre-programmed/programmable tab positions, top of form and bottom of form.

The MS-204 offers the flexibility of 40, 66, 80 or 132 characters per line, the company said. It's compatible with TRS-80, Apple, Pet, Sorcerer or any other Centronics-type system. The $795 price includes complete documentation. For more information contact Bob Lahm, Matchless Systems, Dept. 7, 18444 South Broadway, Gardena, CA 90248; (213) 327-1010. *Circle No. 150*

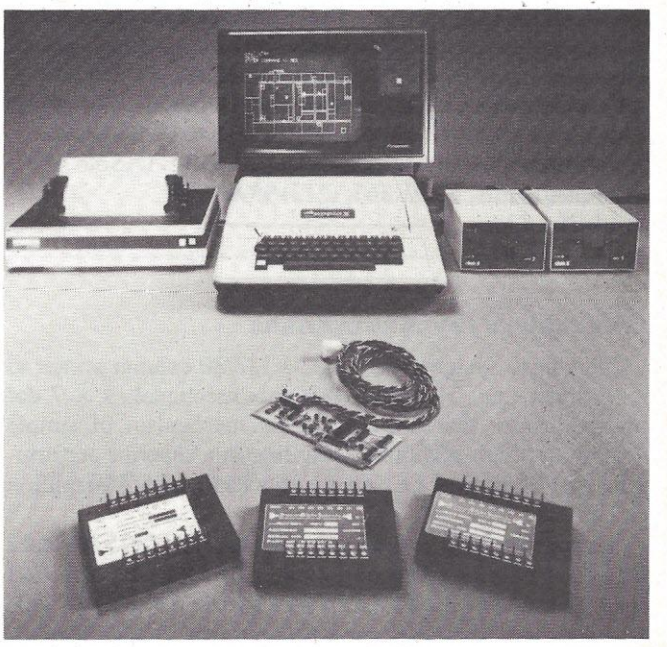
Data Acquisition with the Apple II

American Multiplex Systems, Inc., has introduced a system of remote multiplexing components that may be controlled by an off-the-shelf Apple II microcomputer. The new miniMUX 800 series components make it easy for users to design and install their own data acquisition and control system. Both the user or installer can expect savings of over 50% of the cost of conventional data acquisition and control systems, the company said.

WHAT'S COMING UP

Three different terminals and a special Apple II interface board make the miniMUX 800 Series components well-suited to hundreds of applications: energy control of commercial and industrial facilities; remote site monitoring and/or control; lighting control; remote video switch and camera control; liquid storage tank gauging systems monitoring and control; industrial facilities manufacturing equipment monitoring and control systems; security, fire and safety systems and many more.

The miniMUX 800 Series terminals are completely self-contained ready to install. AMX caters to the do-it-yourselfer with their building block approach to data acquisition and control components, said the company. The miniMUX 800 terminals will interface with computers using the RS-232-C interface unit.



AMX is offering a limited number of introductory starter kits, which include an RS-232-C or Apple II interface unit, one miniMUX 801 input/output terminal with eight discrete inputs and seven discrete outputs, and one miniMUX 802 analog terminal with one input channel of eight bits resolution, and seven discrete outputs for the introductory price of $895. For more information contact American Multiplex Systems, Inc., 1148 E. Elm Ave., Fullerton, CA 92801; (714) 870-5821. *Circle No. 142*

Matrix Printer for Small Business Computers

The Anacom-150 Serial Matrix Printer has been announced by Anacom General Corp.

The new unit prints its 9 × 9 dot matrix bidirectionally while logic seeking the quickest way to print the next line. It has a 136 column format but accepts tractor fed paper of any width. Line feed and top of form controls are at your fingertips, the company said. Vertical format is programmable as are double width characters. Interfacing is accomplished by use of a personality board with parallel or serial interface supplied as required at no additional cost.

Anacom will market the printer nationally and internationally through distributors. It is priced at $1350. For additional information contact Dick Lombardi at Anacom General Corp., 1116 East Valencia Dr., Fullerton, CA 92631; (714) 992-0223. *Circle No. 114*

Two Interfaces for Videotaping Apple Color Graphics

Adwar Video offers two interfaces for bridging the difference between Apple computer graphics output standards and those of NTSC video recording and broadcasting equipment. While the Apple output works well with a dedicated color video monitor, it is incompatible with NTSC signal requirements, ruling out the many advantages of videotaping or telecasting its color graphics.

The simpler of the two devices, the Adwar Apple Proc Mod ($250), is a circuit board inserted into the Apple plug-in slot #7. This brings the Apple output sufficiently close to NTSC video equipment tolerances to permit its direct videotaping.

For more exacting applications, such as combining the Apple color graphics output, through a time-base corrector, with other video signals through a switcher, the more sophisticated Adwar Apple Graphics Interface is required. This more expensive device ($4690) stores an entire non-standard Apple video frame in solid state memory. It then reads out from that memory at standard NTSC rates required for multi-source tape editing, special effects and telecasting on the air. According to the company, at the time of this writing, the product is scheduled to be available in September.

The Adwar Apple Graphics Interface requires all six house system drives, including sync and subcarrier, locking the outgoing signal to those drives. For more information contact Adwar Video, 100 Fifth Ave., New York, NY 10011; (212) 691-0976. *Circle No. 132*

Correction

A product announcement by M & R Enterprises, published in the August *PC*, on an Upper/Lower Case Board for Apple II, contained the wrong address for the company.

The correct address for M & R Enterprises is P.O. Box 61011, Sunnyvale, CA 94088.

Personal Computing apologizes for any inconvenience this error may have caused. *Circle No. 145*

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SYSTEMS

Price Reduction On Floppy Disk Systems

Altos Computer Systems announced a price reduction averaging 10 percent on its single-user floppy disk systems utilizing single or dual floppy drives.

The reduction positions the Altos systems within the price performance range of smaller floppy disk based systems costing from $3500 to $4500, the company said. The systems feature Shugart floppy disk drives, fully socketed single board computers with Z80A processors, and communications capabilities including asynchronous, bisynchronous and networking. All systems are available for immediate delivery. For more information contact Altos Computer Systems, 2360 Bering Dr., San Jose, CA 95131.
Circle No. 146

New Single Board Computer

Vector Graphics Inc., has introduced a new single board computer. Designed to function as the center of an approach to system design, the new ZCB single board computer generates all standard S-100 bus signals, including emulation of an 8080 CPU, and contains a Z80-A operating at 4 MHz, 1K of high-speed static RAM memory, 3 sockets for up to 12K of PROM, one serial port and three 8-bit programmable parallel ports.

According to Vector, circuitry is provided to support static or dynamic memories. Use of 2708, 2716 or 2732 PROMs is jumper selectable and the addressing of the PROM and RAM is completely variable. Use of wait states on bus cycle and/or instruction fetch cycle is also jumper selected.

The serial port makes use of the Intel 8251 USART, which enables software to control the format of the transmitted data and to vary the mode of transmission. A dip-switch is used to specify the basic rate between 110 and 9600 baud. The parallel ports use the Intel 8255 which allows the same lines to be used for input and output under program control, and allows a great deal of flexibility in the assigning of lines to I/O addresses, also under program control, said the company.

The use of the ZCB single board computer in Vector's own computers enables efficient development of special-purpose systems. For process-control or instrumentation problems, a designer can compose and test new software and interface-hardware entirely within the full-strength computer system, connected directly to the process being controlled, said the company. Vector's variety of I/O boards, supplemented by dozens of S-100 I/O boards from other vendors, can be inserted directly in the full system. When testing is complete, the target software and hardware, centering around the ZCB single board computer, is then moved to its final chassis with no downloading or in-circuit-emulation required.

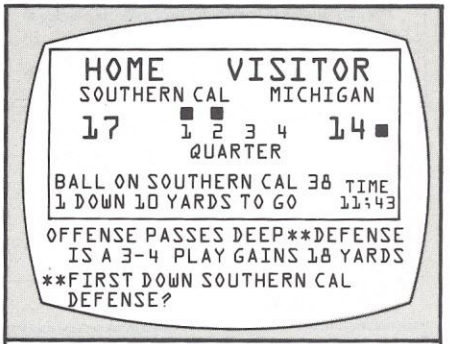
The ZCB single board computer has a suggested retail price of $395. Immediate delivery is available from off the shelf inventory. For further information contact Carole Ely or Robert Harp at Vector Graphic, Inc., 31364 Via Colinas, Westlake Village, CA 91361; (213) 991-2302.
Circle No. 153

Intelligence Provided By Single Board Microcomputer

A single board microcomputer, the M-80, which has a Z-80 CPU, sockets for 2K/4K of PROM, 2.1K of RAM, 16 highly flexible I/O lines and a system clock, has been introduced by Miller Technology. The board also provides a breadboard area and 12 decoded address strobes for easy user customizing, the company said.

The 4.5 inch by 6.5 inch board was designed for test equipment, smart peripheral controllers and dedicated control and processing applications. The board may be mounted in a card cage or by standoffs.

Two software packages are currently available. A monitor contained in a single ROM enables you to dump or enter data into memory, set breakpoints, control I/O lines or download programs from another computer. An integer Basic provides 30 functions and commands, and permits calling machine language routines. Both monitor and



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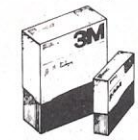

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CIRCLE 61

Basic use serial I/O for communications.

Unit prices start at $28.50 for the bare board, $69 for a kit, and $185 for a fully assembled and tested board. The assembled board is guaranteed for one year. For more information contact Miller Technology, 16930 Sheldon Rd., Los Gatos, CA 95030; (408) 395-2999. *Circle No. 143*

On-Site Service for Apple Products

Bell and Howell has expanded its nationwide service organization to include on-site service of Apple Computers and is expanding its existing service on video products.

Trained electronic technicians can diagnose problems and repair equipment on the spot, said the company. More than 600 Bell & Howell service representatives are located across the country. Complete parts inventories will be maintained locally.

For more information contact Bell & Howell Information Systems Service Operations, 6800 McCormick Rd., Chicago, IL 60645; (312) 539-1077. *Circle No. 144*

Turnkey System for Small Businesses

The Minimax, a complete small business computing system that is marketed through office products dealers, was announced by Computhink, Inc.

Minimax features a set of business software programs that are included with a hardware system. Both the hardware and the software are sold together as a complete "turnkey" system, giving you a computing package that is ready for immediate use, the company said.

Minimax's business software consists of seven integrated programs: accounts payable, accounts receivable, payroll, general ledger, a data base manipulation program, word processing and a program that gives Minimax data communications capabilities.

Hardware comes with a microcomputer that contains a large internal memory of 108K bytes, a video display terminal, a standard keyboard and a floppy disk system that has capacities ranging from 800K bytes to 8.4 megabytes, giving the system the capability of storing over 3000 pages of data.

The Minimax system is priced under $10,000. For more information, contact Computhink, 965 West Maude Ave., Sunnyvale, CA 94086; (408) 245-4033. *Circle No. 148*

Correction

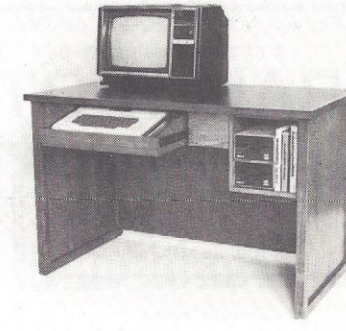
A product announcement published in the September *PC* contained errors in pricing on a new desk-top business system.

The correct suggested list price for the Archives Business System is $6500. Archives Incorporated, 404 West 35th St., Davenport, IA 52806; (319) 386-7400. *Circle No. 157*

COMPLEMENTS

Apple Desk

Furnwood Manufacturing has available a computer desk with custom fitted areas to hold Apple II or Apple II Plus computers. The desk is handcrafted in wood on the same lines as the Furnwood desks for larger computers. The drawer in front is designed to hold the



Apple Computer at a comfortable typing height, and a space saving custom area for the disk drives is easily accessible for loading disks. The drawer and disk drive area are engineered for air flow and cooling. The disk drive area may on request have a 4-1/2 inch hole cut allowing installation of a muffin fan for additional circulation.

The desk has a work top area of 27"

by 48″ and is built to a height of 30″. It is finished in a Salem maple stain but can be ordered in other stain finishes. The desk is sealed with mar-proof lacquer for protection. Upon request other compartments may be custom fitted for additional equipment or drawers may be added. The back has cable cut outs to keep a clean uncluttered look for anywhere in your home or business. Models are also available for the Atari and TRS-80 computers.

Suggested list price is $400. For additional information contact Furnwood Manufacturing, Inc., 5665 S. W. Carman Drive, Lake Oswego, OR 97034; (503) 636-1991. *Circle No. 149*

Technical Reference Manual

APF Electronics, Inc., announced literature for its personal computer, The Imagination Machine with a Technical Reference Manual.

Manual includes nine chapters explaining technical details from memory maps, memory usage for programs and variables to entering and using machine language plus saving time and space, the company said. The three appendices include schematics and parts layout while the entire manual is illustrated with diagrams and charts.

It is available for $2. For information contact APF Electronics Inc., 444 Madison Ave., New York, NY 10022, (800) 223-1264. *Circle No. 151*

Computer Terminal Desks

A new line of stylized computer terminal desks that increase work areas and save floor space has been introduced by Data-Mate, The Maine Manufacturing Company.

Desks feature large tops and supply compartments to enhance operator efficiency and conserve floor space the company said. They also provide leg room for operator comfort, and black steel frames accented with chestnut wood grain tops and trim.

Available in 27″ or 30″ heights, the desks are offered in 5 styles with 30″ × 48″ or 60″ tops, and a 19″ EIA rack mountable bay, supply drawer or hinged door cabinet. A tape/diskette model includes a compartment for a tape or disk drive and drawer for tape and disk storage.

Desks are priced from $298, depending on style. Literature is available on request. For more information contact Data-Mate, The Maine Manufacturing Co., 46 Bridge St., Nashua, NH 03060; (603) 883-5142 or (800) 258-1678. *Circle No. 152*

Data Communication Products

International Data Sciences, Inc., is offering free copies of its new 1980 Catalog of Data Communication Products.

The 29-page catalog features the company's Hawk 4000 Series Datatraps that provide a CRT display of on-line data communications. Also described is a complete line of Range Rider data test sets for synchronous and asynchronous modems, TDMs and FDMs; EIA and telephone line patch, monitor and switching modules for tech control centers; data cables; error detection devices; and MiniTest interface monitors and breakout panels for EIA, Bell 301/303 and V.35 interfaces. Also featured is the new Model 65/60, the company's first hand-held, battery operated modem test set and breakout panel combined.

For a free catalog write Marketing Department, International Data Sciences, Inc., 7 Wellington Road, Lincoln, RI 02865. *Circle No. 154*

On-Site Service For HP-85

Hewlett-Packard now offers "on-site" service as well as its previously offered "return to HP" service for the HP-85 personal computer.

Under the on-site service agreement, which has covered other HP desktop computers, HP-85 system owners pay a monthly cost for next-day response to all sites within 100 miles of an HP service-responsible office.

Cost of the on-site agreement is $25 per month. For an additional fee, HP-85 peripherals such as printers, plotters and flexible disk drives will be covered by the on-site agreement.

HP-85 owners farther than 100 miles from an HP service-responsible office will be covered by an on-site service agreement with a longer response time and a higher price.

Those who don't require as comprehensive an agreement may, for $17 per month, choose a field repair center service agreement. Under this plan, a unit needing service is shipped to one of the designated HP field repair centers throughout the world. HP will fix and ship the unit within three days of receipt.

Owners of HP-85s purchased before these agreements became applicable will be able to obtain coverage if their units are still under warranty. Machines that are out of warranty must be inspected before they will be covered by the new agreements.

The on-site service agreement will be offered on all HP-85s, whether sold by computer stores, office machine dealers or HP's sales force.

The HP 2621 terminals, which recently became available through dealers, also can be covered by an on-site service agreement.

For additional information on obtaining an on-site service agreement, see your local dealer or contact Inquiries Manager, Hewlett-Pakcard Co., 1507 Page Mill Rd., Palo Alto, CA 94304; (800) 547-3400 (in Oregon, 758-1010). *Circle No. 112*

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- **Japan:** K. Yanigihara, International Business Corp., 10-10 Shinjuku 3-chome, Shinjuku, Tokyo, 160 Japan: (03) 350-0272.

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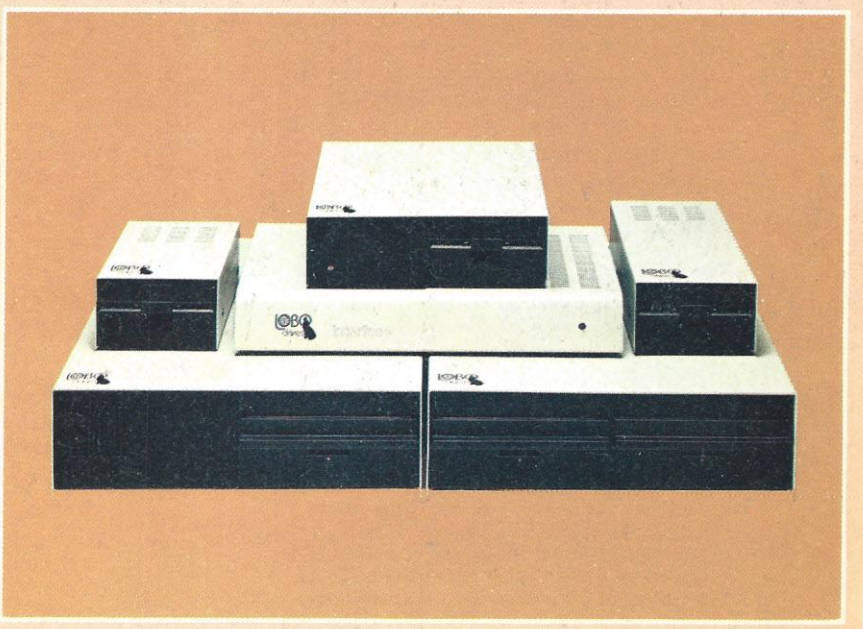

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